VOL. 172, NO. 4 AMERICAN APRIL, 1950

Gas Journal

81 MAY 10

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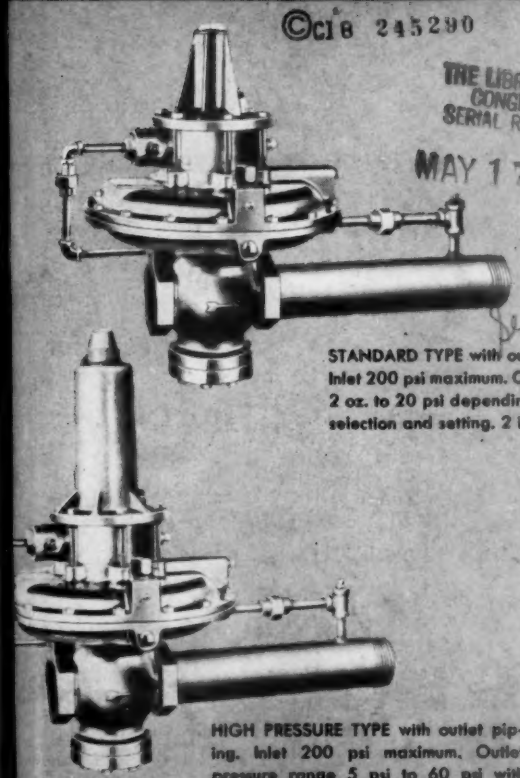

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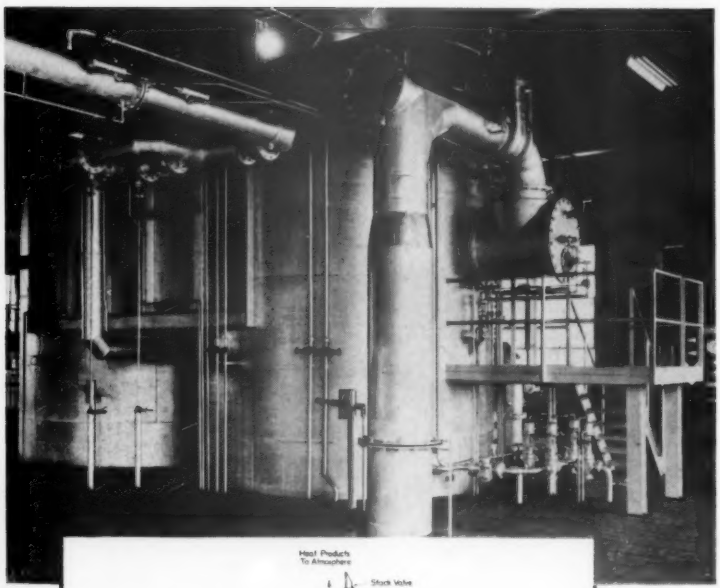

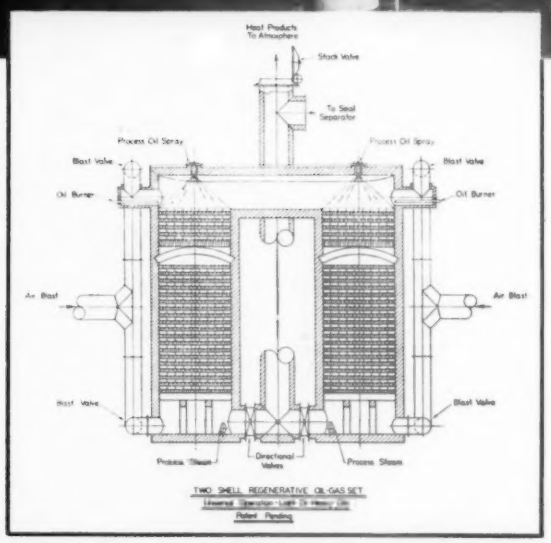

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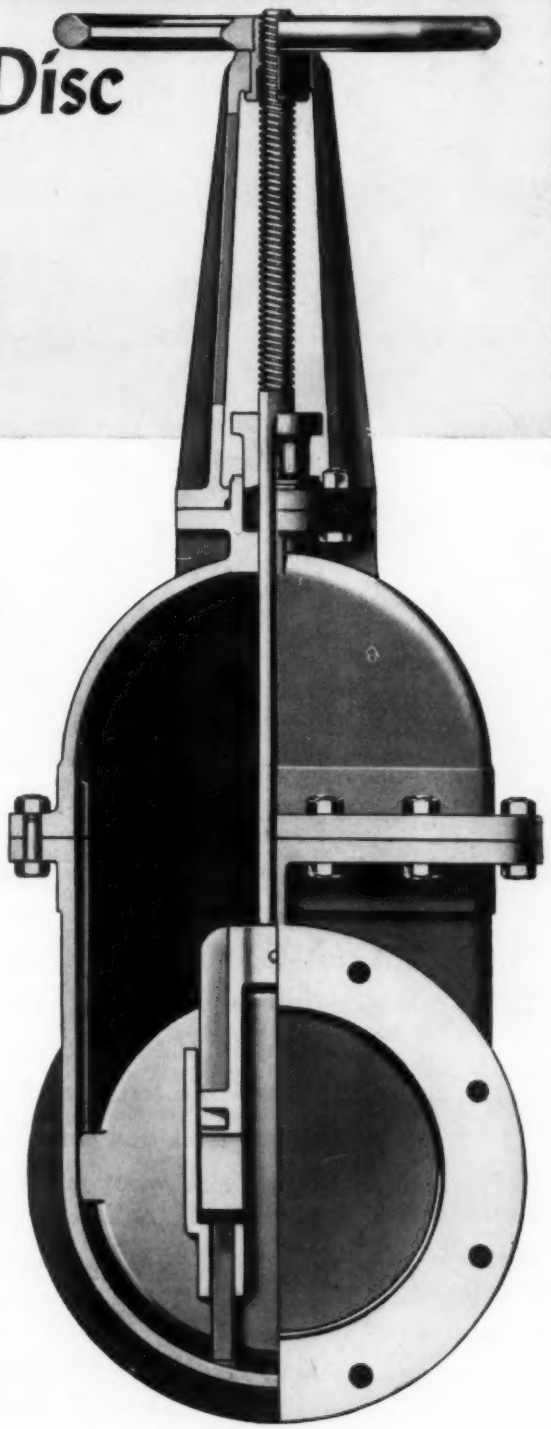

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Without crushing strength—or, for that matter—without all of the strength factors listed opposite—no pipe laid 100 years ago in *city streets* would be in service today. But, in spite of the evolution of traffic from horse-drawn vehicles to heavy trucks and buses—and today's vast complexity of subway and underground utility services—cast iron gas and water mains, laid over a century ago, are serving in the streets of more than 30 cities in the United States and Canada. Such service records prove that cast iron pipe combines all the strength factors of long life with ample margins of safety. No pipe that is provably deficient in any of these strength factors should ever be laid in city streets. Cast Iron Pipe Research Association, Thos. F. Wolfe, Engineer, 122 So. Michigan Ave., Chicago 3.

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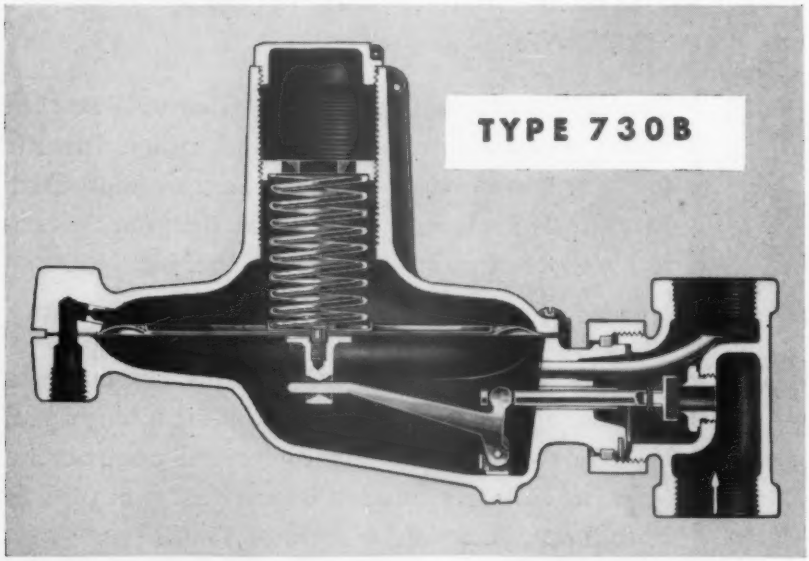

For any set of service conditions—the famous Fisher Type 730 Series is recognized as the logical choice. This complete regulator family offers a type that incorporates every desirable feature to provide satisfactory performance. High gas pressure in pounds is automatically reduced to a constant reduced pressure of ounces or inches of water column to the outlet system. Valve discs and orifices are both renewable without breaking any pipe joints. They can be readily inspected or replaced by simply unscrewing the union connecting nut. 730 Series are especially designed for manufactured, natural, Butane and similar gases. Used by major gas companies throughout the United States. Type 730B, illustrated above, is a general service regulator available in sizes ¾", 1", and 1¼", has a ¼" tap in the top casing for connecting piping out to atmosphere where regulator may vent safely. Also supplied with bottom weatherproof vent-Type 730BH for outside installations.

FISHER GOVERNOR COMPANY

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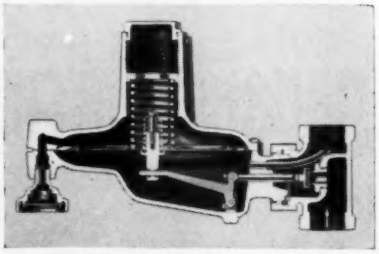
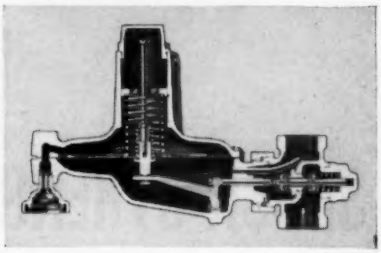


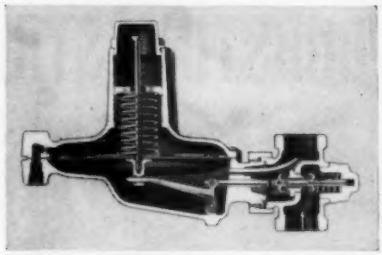
TYPE 733B

Type 733B with built-in relief valve, in sizes ¾", 1" or 1¼", designed for outdoor installation. A special weather proof and freeze proof vent protects the vent hole from being blocked by weather or insects. Available as Type 733BT for indoor installation. Upper diaphragm casing tapped for vent pipe to outside. Includes weather-proof vent.



TYPE 739B

Type 739B—Service regulator with the safety cut-off valve as described above but also includes safety relief valve set to relieve at 1 pound to eliminate over-pressuring the house piping and appliances.



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Type 738B—Service regulator with safety cut-off valve which closes with loss of gas pressure and stays closed until manually opened. Eliminates explosion hazard during emergency loss of gas pressure.

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AMERICAN Gas Journal
ESTABLISHED 1859

VOLUME 172 APRIL 1950 NUMBER 4

This month...

Historical accuracy suffered something of a slight at the hands of E. H. Eacker, President of the New England Gas Association, when he told his group that in 1880 (the year of the formation of the Guild of Gas Managers) "trade journals and other communication facilities were largely or entirely lacking." As a matter of record, the AMERICAN GAS LIGHT JOURNAL, our predecessor, had already been publishing continuously for 21 years by that time. Possibly we came under the heading of the "largely lacking."

In August of 1949 James E. C. Currens (see page 10) wrote us in part: "Gas departments are in a squeeze between the curve of decreased unit earnings and . . . increasing labor and field costs. . . . I would suggest that the whole subject of crew organization, . . . so that production methods can be used, become an important part of the content of your magazine. . . ." This month and next, Mr. Currens gives us a two part article outlining in detail how PG&E is tackling the problem. We have a deep and abiding respect for the counsellor who not only *tells us* what to write, but goes ahead and whips out a few thousand words as an example.

In this business we get used to mixed reactions. One subscriber said, of the editorial "A Demand Charge for Heating" (March AMERICAN GAS JOURNAL) . . . "it would pay you to learn something about the economics of the gas business before you advocate any measures that might restrict house heating sales." Another wrote: "There are many who will resent your editorial but there are few who can dispute the facts presented therein. . . . If possible I would like to have 1,000 reprints. . . ." Our greatest weakness is that we have failed to master the "nevertheless-on-the-other-hand—" technique of writing. That leaves everybody happy or lulls them to sleep; we are not sure which.

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Elliott Taylor · Editor

Howard F. Weeks · Associate Editor

Arthur Rohman · Western Editor **John F. Falvey · Financial Editor**

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Editorial:

Policy Poppycock

SENATOR FRANCIS J. MYERS, a Pennsylvania soft coal Democrat, and Congressman Ivor Fenton, hard coal Republican from the same commonwealth, both have resolutions pending in Washington calling for investigation and study of the fuel resources of the nation, with a view to arriving at a so-called national fuel policy.

Not many weeks ago a few independent oil operators proposed a joint government and industry study of the competitive position of petroleum products and natural gas in the fuel markets of the country. The ultimate goal of that study was also presumed to be a statement of national policy with respect to these two important energy sources.

God forbid that we should ever raise a word against an honest endeavor to arrive at a policy on anything in a country so long guided by nothing nobler than the fractious demands of political expediency.

But between the ideal of stating a policy, and the practical realities of implementing it, there is a great gap that none of the instigators of investigations and studies have yet seen fit to bridge. Obviously what most of the proponents of "fuel policy" are looking for is some kind of unilateral enactment that will enable them, at the least, to arrest further expansion of natural gas. And no doubt there are a few who are naive enough to hope that some legislative windfall may even go so far as to restore to them the markets that they have already lost.

Declarations of national policy are both meaningless and impotent until the necessary legislation has been passed to make them effective. No one attempts to conduct his affairs—no industry would dare chart its course—on anything as ephemeral as national policy. What people obey is laws, with clubs and guns and courts and jails to enforce them.

So when you strip the proposal of its fancy trappings, all of the call for a national fuel policy amounts to is a call for more laws. If that is what the boys want, we suggest that a good starting point would be to place all coal and all oil under federal and state regulation as public utilities. Go right ahead and set the price of oil at the well, of coal at the mine, and regulate the service conditions under which it can be moved in interstate commerce. And while we are at it, let us not overlook the desirability of regulating wages and forbidding strikes in the coal industry, as being inimical to the public interest and a threat to national security.

There would be a national fuel policy with teeth in it. And the funny thing about it is, it wouldn't impose any more regulation on the gas industry than it already has.

So we say again, if that is what the coal and oil industries want, bless their trusting hearts, let them have it.

Silent Spokesmen

AT THIS writing the Kerr bill to exempt independent producers of natural gas from regulation by the Federal Power Commission has just been passed by the Senate. The House version of the bill has already been passed, and as soon as the differences between the two scripts have been ironed out, the measure will go to the President for his signature or veto.

During the weeks of protracted discussions on the bill its chances of passage appeared to grow slimmer by the day. What had started out to be a simple reaffirmation of congressional intent in the original natural gas act, namely, that FPC jurisdiction did not embrace the production of natural gas, was whipped up into a *cause celebre* by commentators and columnists. A baffled and bewildered public was fed the suggestion that here was a measure destined to add millions of dollars to the monthly bills of natural gas consumers.

Senator Douglas of Illinois went whole hog, saying that natural gas prices might be increased $16 billion dollars over the next 40 years if the bill were approved. Governors of states and mayors of cities all crowded into the act, viewing with professional alarm the incalculable damage that would be done to their citizenry if the bill became part of the natural gas law.

As far as we could observe, everyone had his say but the spokesmen for the natural gas industry, whoever they may have been. Perhaps it is only fair to assume that since the bill squeaked through by a vote of 44 to 38, their work was effective. It certainly was dignified and restrained.

But somewhere along the line some official industry voice should have been raised to point out a few of the simple truths of the situation. That this was not a measure to rob the FPC of any powers it had ever been granted; that it was a bill designed to stop the commission from further encroachment into a field of regulation that the original Natural Gas Act had specifically precluded from its jurisdiction; that the price of natural gas at the source had practically doubled since the beginning of the war years, while the average price at the consumer level had gone down, and not up.

If the President signs the Kerr bill, it will be a victory, of sorts, for a large segment of the natural gas industry. But from the standpoint of public relations, the misrepresentations that were allowed to go unchallenged and unanswered have done nothing but harm.

Elliott Taylor

Experiments Made in Installing Services On Production Line Basis

By James E. C. Currens
Pacific Gas and Electric Co.

This article on mechanization and organization of gas service installations will be presented at a conference of the Pacific Coast Gas Ass'n at Fresno, Calif., on April 27-28.

It is presented to American Gas Journal readers in two parts, with Part 2 appearing in the May issue.

Mr. Currens is superintendent, gas operations, northern area, PG&E.

THE Pacific Gas and Electric Co. has recently experimented with the production line method of installing gas services, especially to keep pace with peaks in home construction.

For some time we have known that our gas service installation work required scrutiny. Installation crews have been unable to keep up with increased home building. Recourse has been made to contractors and to our general construction crews. Still, at several points in the northern area the backlog is rising rapidly, as can be seen from the curves in charts 1 and 2. The purpose of this study was to ascertain whether or not it were possible to select a group of services out of the total work of a district or division for assignment to a production crew set up without any thought of standard organization plans. The crew would be made of component parts, all of which would move at the same rate so that mechanization in its true definition might be instituted. We are forced to the conclusion that our crews in some way lack the production abilities of contractors who are practically doubling our man-day output.

Poor implementation and techniques of welding or wrapping which might be found in error are excluded.

A visit was made to the field and time spent with crews operating in one of the districts of the North Bay Division. It is very difficult to appraise the overall efficiency of a crew by spot visit. It is necessary to spend some time to get a picture of the complete operation on an average service.

Operation, as found, was simple and has been developed, we believe, largely in the field by the field foremen. The crew visited was particularly expert and worked together as a very fine team, and there is certainly no criticism of the operation as found.

On arrival at the service location, the foreman immediately located the main. Ordinarily, this was easy, but many times it was necessary to use a pipe locator. During the use of the pipe locator crews were prone to bunch around the foreman in the interest of learning just where the main was located.

Next operation, of course, was the "spread-out" of the men between the bell hole, the meter location, and along the service. If the service were dug by machine, it was necessary to do some clean up work, particularly around the meter location. Ordinarily, the bell hole was not dug with the trencher, so two men with an air line and air tools attacked the bell hole. Meantime, the light foreman and a helper laid out enough service pipe to form a boring bar string. This was welded up completely and usually amounted to the width of the road, plus about half of the service run on the customer's property.

As quickly as the service trench was cleaned up and the boring bar was complete with the machine welded on one end and the bit welded to the other end, all hands manned the boring machine and the service was run under the roadway. With the service string under the roadway, the next operation was that of the center and the service "T" welds. These were made by the light foreman with the very efficient aid of a "helper."

While the welding was in progress, the balance of the crew was badly held up as it is not possible to lay down either end of the service and backfill on it until the center weld was made. If ends were backfilled and fixed, it was impossible to crowd the service into the ditch. As soon as the service was welded, tested, and wrapped, it was possible for the crew to begin the final backfill and tamping operation. While this was going on, the welding foreman tackled the tapping of the service "T". Sometimes this work was assigned to a helper, but usually the foreman handled it himself.

As the tapping was completed, usually the balance of the service was nearly backfilled, and the wrapping of the service "T" itself was tackled. With the service "T" wrapped, all that was left on the job was the tamping of the bell hole, clean up of tools and work area, and loading of equipment. The last move on the job usually was the measurement to the nearest property line for the service record.

Field inspection showed that the equipment was fairly good, consisting of a ton and a half truck with standard gas body, usually a hand-held boring machine of the sled-type, a butane tar pot, tapping equipment, and hand tools.

Personnel in the districts fell into two organizations: one, a heavy crew of ten or 12 men and a foreman; and, two, a standard light crew of a foreman and five men. The heavy crew in two units was supervised by a heavy foreman. Usually, one of the six-man units was supervised in the foreman's absence by a clerk driver or a fitter, the driver and the fitter being separated between the two units. Of course, the standard light crew was supervised by the foreman himself.

The light crew visited was a smooth working team and very little supervision was necessary. An occasional word or a nod was all the men needed as they quickly spread to their regular routine duties which seemed to be repeated over and over again, showing that they had thought the jobs out well and knew exactly what they were going to do.

As can be seen from chart 3, lost

time accumulates at four points during the operation of our standard crews: First, during the location of the main; second, while the bore is being made. This second waste may be due, partly, to equipment. It does not seem reasonable that six men would be required for the bore when four of them are engaged in pulling the machine itself. The third loss arises during the welding of the service "T" and the middle weld as no backfilling can be done until these are complete, and the last loss is during the wrapping of the service. The service has to be in the bottom of the ditch before the filling can start. As illustrated on Chart 3, we believe these losses run into five hours per day on the six-man crew. We have left out the locating losses because these can be easily eliminated.

We have noted that a number of operations in the gas department are being accomplished by department people, which, we believe, belong in the sales department. One of these duties is that of the original survey of the service. We have trained people in the sales departments of all our divisions who are capable of locating a meter location while they are making the survey of the application. I believe it would be possible on this same trip to locate the main. This could be done either from a sketch furnished before the estimator leaves the district office, or by the use of a pipe locator.

The question of how to leave a marker for the crews has been considered. It has been suggested that a small furrow, say 3″ or 4″ deep, be carved along the route of the main. This would not be a hazard to traffic or pedestrians and should last for a short period. Also, it has been suggested that air slacked lime be laid as a marking agent.

As dispatching is certain to be one of the critical operations in production of line work, certain information will be necessary for the dispatcher to send out crews. In one case, there may be a "long side" service which will require a bore. The next may be a "short side" location which will not require a bore, in which case the boring crew certainly should eliminate this stop. It will also be necessary to assist the boring crew in some cases as we may find that boring is the operation which is absorbing the time, and any advantage should be given this crew, such as skipping services.

Chart 3 shows clearly that the major portion of our loss centers around boring. Some of this can be helped by some attention given to bits and to the machine itself. However, the principal loss comes because of the hold up of the whole crew until the bore is completed. In the revision of crews, we certainly would propose that the boring operation be separated from the general crew and follow immediately behind the trenching operation. Then, should a difficult bore be encountered, the time of two men only will be lost.

Napa . . . . . scene of the experiment

We also would recommend that the operation of boring itself be changed. Instead of using the service string as the boring bar, with the resultant loss of time while the machine is actually welded to the bar on one end which welds are lost, we would propose the use of long special boring bars which would be carried on the side of the compressor as we now carry pipe. These bars of extra length would eliminate time now lost in coupling and uncoupling on the conventional Hydrauger. Also, the use of the bars would remove from the service string any of the existing hazard of pipe wrapping damage. We have noted service pipe emerging from a bore with the wrapping neatly turned off. A sharp object or obstruction some place along the bore held against the revolving string and acted as a lathe tool.

Several of the divisions are making quite a specialty of boring, and, certainly, it is the principal time saver as well as time loser in the whole operation of service installation. Such measures as providing gasoline driven rigs to be inchangeable with air driven, carrying a trailer with 1,000 gallons of water for bores beyond water service or where no customer's pump is handy are being instituted.

The boring crew would be dispatched from data returned by the gas estimator. Data must include information as to whether or not a bore is necessary, whether or not water is at hand, whether or not it would be a rocky or an easy bore. Also, it should carry information as to whether or not a lawn or shrubbery could be avoided by the use of a bore. This sometimes would cause the dispatching of a crew to a particular location even though it were on the "short" side of the street.

It can be seen on Chart 3 that the last source of waste time follows boring and happens during welding of the service "T" and the middle weld. Some time is lost during the wrapping of the service. The wrapping of the service "T," the next to the last operation of the whole job, usually does not result in waste time as the balance of a well-organized crew would begin the clean up of tools and the loading of the truck. It would be a great advantage if the middle weld could be eliminated altogether as the short section now used as a boring bar has to be tested by itself and, then, again, the whole service has to be tested after the middle weld is made. If there were no middle weld to make, the tapping of the service to the service "T" would make it possible for the crew to begin complete backfill of the whole thing except the bellhole. This is another strong reason for dropping the practice that we are now

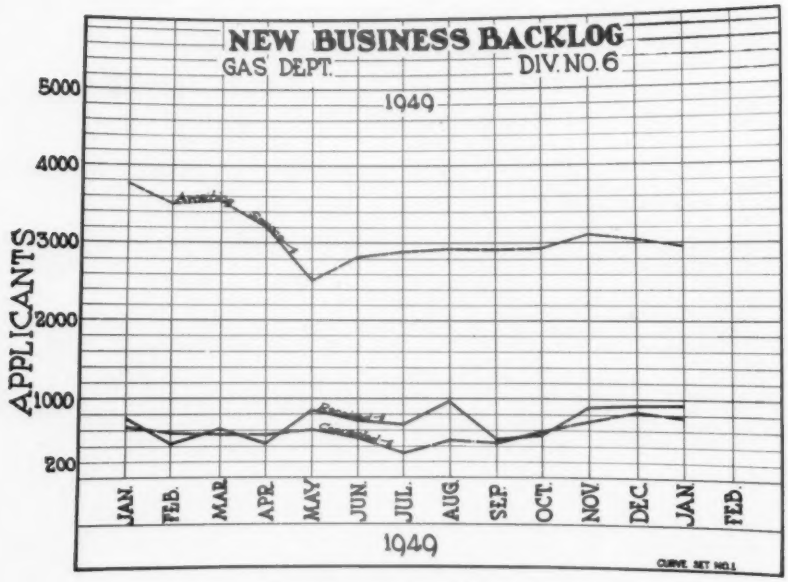


Chart 1—showing division 6

using, that of using the service itself for the boring bar strength.

We decided that the use of the service for a boring bar introduced a grave question as to the condition of the wrapping. We will never know until a leak how many services were actually damaged during the boring operation. In light of the above reasons, we propose that the boring be done with standard bars which are removed from the hole and the service itself installed. In order to furnish work immediately for all men upon their arrival on the job, we also propose that the welding be done with or before the digging operation.

It must come here if the boring crew is to install the service pipe in the bore, and they are certainly the proper people to do it. In case a bore is not cleaned and it is necessary to rebore a portion, and, if the job were left for a following crew, a bad mix up would result. Service would be welded as the trench is dug, or before. The arrival of the boring crew would not be held up in any way; they would make their bore and put in the service, and they would not necessarily need to do more than line it up with the main so that the service "T" could go on. There is some chance of the service being gripped by the bore if it stands for any length of time. This would eliminate any cutting in case the service were shifted. The riser end of the service could be left for the final crew, it only being necessary to assure that enough service pipe was left to make the riser. With this system, the losses due to the wrapping of the service would be obviated completely, as there would be no wrapping to do while other men were on the job. This wrapping would be done by the first crew. It is a very small job, but nothing else can happen while it is being done.

Chart 4 includes most of the revisions which we have mentioned. The job, instead of being done by a single crew, will now be done by three crews. The first crew, the head or digging crew, would use two men. The second, a specialty crew for boring could be handled by two men. The first crew would dig the trench, rough dig the bell-hole, weld up a string sufficiently long so that a service "T" would be reached and the meter location covered on the other end. They would then barricade, set out lanterns, and leave the job.

The boring crew next would arrive on the job and would find that the pipe was ready for them to install in their bore, that the trench was open for the sled-type boring machine and that a rough bell-hole was available so that they could tell about where their bore was with respect to the main. They would make the bore, test the service pipe, as the original digging crew would not have a compressor, and would install the plugged and capped service pipe in the bore and align it with a jig to the main. They could now leave the job.

The third crew would care for everything after the bore was done. This crew could be handled with three men and the work can be easily visualized when we think of the work already done when they arrive on the job. Their work would consist of digging out the bell-hole so that the welder could get down to the main for the service "T" installation and so the wrapper could get around under the main with his wrap. We are suggesting a step bell-hole rather than the full 3' by 3' hole which is now dug to a position eight inches under the main. If the welder can get his body and shoulders into the hole, a smaller excavation around the service "T" is sufficient, say 1½ feet by 2 feet. This will result in some saving in excavation and it will also fit the slope of the trenching machine cut. It should not take long to dig out the balance of the service, say 30 minutes. This seems high, but in some cases, there may be a reason for 30 minutes as an average. While the digging is going on, a service riser can be bent, tools can be assembled at the bell-hole together with the welding outfit, and as quickly as the trench is complete and the main and the serv-

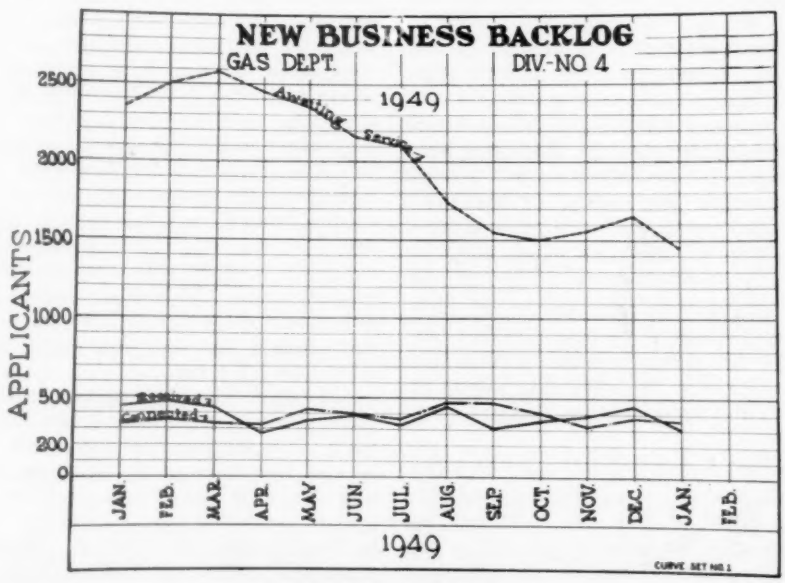


Chart 2—showing division 4

ice tested and placed into the trench, a tack to the service "T" can be made. As quickly as the service "T" is tacked to the service, welded to the service, and welded to the main, the wrap can be made and the job can be completed.

While this single welding operation is going on, the backfilling can be started by the balance of the crew. All that is left then is clean up of tools and assembly on the truck. There will be some lost time again while the service "T" is being installed and tacked. We do not see why this should run over ten minutes, as there is lost time for only one man since the helper and the light foreman will be engaged with the service "T." With only one man available for backfilling, we can see that machine assistance is valuable at this point.

Chart 4 shows the head end crew of two men, which is the digging crew and lays out and welds up the strings of service pipe. Their prime prerequisites are two, the first being a light, fast, mobile trencher, digging a six inch trench; second, a welding outfit and some means of cold wrapping of joints. It will also be necessary to pull a trailer as this crew will distribute the pipe and weld up the service string. Because they do not complete the job, it will be necessary for them to carry barricades and lanterns. As they arrive on the job, they should find the service marked by the sales department surveyor; also, the meter location and the main location should be marked. It will be their duty to dig the bell-hole, at least rough dig it, locate the main. They then will dig out the service itself. Meanwhile, the welder, who is with the machine as the second man, will weld up the service string and wrap the joints. Lanterns and barricades will be put up and the crew will move to the next job.

Following the digging crew, we would have a specialty crew for boring. They will need a compressor and a boring machine. It may be that in some sections where water is not available that they would carry a tank with sufficient water for one bore. The boring machine would be of the sled type, using 20 foot bars with standard acme joints, giving it sturdy and stiff boring strength. Three-quarter inch pipe has a very strong tendency to whip, and large bows form which must be held down with shovels or feet of some of the helpers. This is a poor arrangement. However, the crews have been doing remarkable work and have made remarkable records with this method. In case it is necessary to use water out of the tank, a small, air driven pump would be necessary to boost the pressure for the boring machine. We have noted that some crews have connections so that air

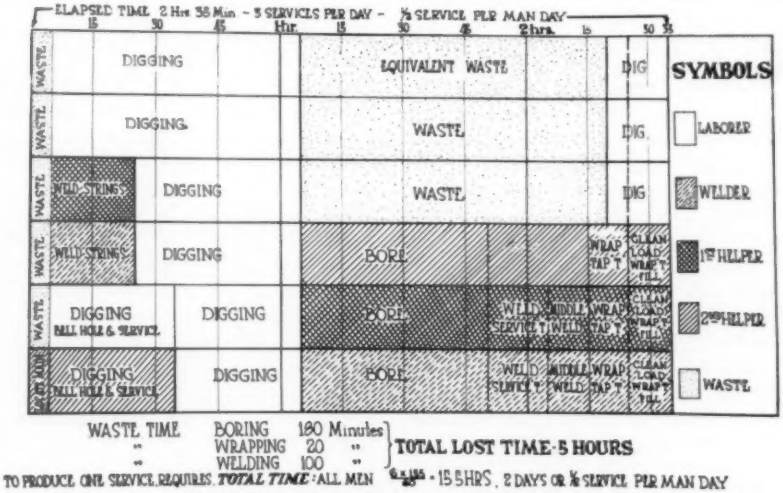


Chart 3—"as found" gas service installation

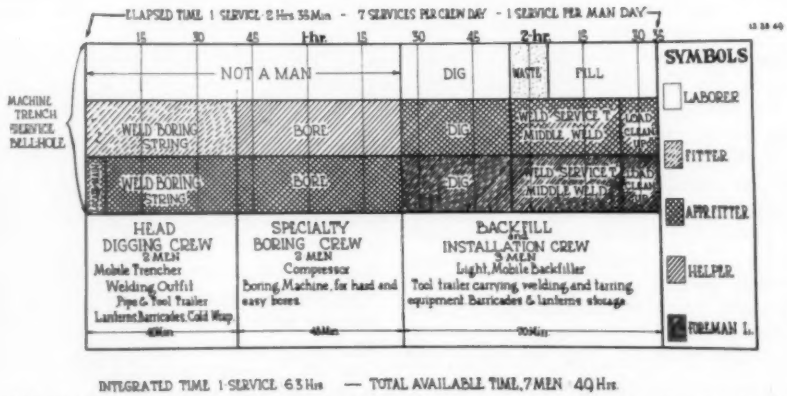

ELAPSED TIME 1 SERVICE 2 Hrs 35 Min - 7 SERVICES PER CREW DAY - 1 SERVICE PER MAN DAY
NOT A MAN
DIG
WASTE
FILL
SYMBOLS
LABORER
FITTER
APPRENTICE
HELPER
FOREMAN L.
MACHINE TRENCH SERVICE BELLHOLE
WELD BORING STRING
BORE
HEAD DIGGING CREW 2 MEN Mobile Trencher Welding Outfit Pipe & Tool Trailer Lantern Barricades Cold Wrap
SPECIALTY BORING CREW 3 MEN Compressor Boring Machine for hard and easy bores
BACKFILL INSTALLATION CREW 3 MEN Light Mobile Backfiller Tool trailer carrying welding and tarring equipment Barricades & lanterns storage
INTEGRATED TIME 1 SERVICE 6.3 Hrs — TOTAL AVAILABLE TIME 7 MEN 40 Hrs.

Chart 4—"1st proposal" gas service installation as mechanized and organized

may be driven through the boring string behind the column of water. This cleans the bits and the effect is immediate. However, we would suggest that this be an automatic valve switching, using a three-way valve with the proper sequence so it will be impossible to get the water into the air motor. The question of bits, which does not properly come under this heading, of course, is important, and all we will suggest here is that crews be equipped with modern bits for boring in hard pan and rocky materials. Where rock is encountered, it is a great deal cheaper to bore, even though the going is slow. An oil well type of bit would help this situation.

The last crew, the backfill and installation crew, will need several men. We are not sure just how many, but we are willing to start with three. They will need a tool trailer, welding and tarring equipment, barricades and lanterns with storage space for all the above. There is no backfilling and tamping machine on the market which would meet the necessities of this crew. A split blade angle dozer blade in two parts to return the earth from both sides of the ditch would be a necessity. We are hoping that a back tamper can be worked out soon, as it is very necessary to tamp the bell-hole and the portion of the service which is in the shoulder or the highway itself.

The total elapsed time of the installation of the service would be the same under either plan. From the time a crew starts working on a service until it is complete, whether it is done at a single stretch or in a series of three stretches, makes little difference in the length of time to do the work. *There are certain necessary operations, which, when added end to end, determine the length of this period.* We saw in Chart 3 that about two hours and 35 minutes is a good average for the installation time of a service, using six men. This type of crew will get in an average of three services a day, or a half service per man day. This same two hours and 35 minutes will necessarily appear on the mechanized crew. We can perhaps cut it down some by eliminating the middle weld in the service, and, of course,

we are hoping that a great deal can be done in shortening the boring time.

The reason the bore wasted so much time on Chart 3 is that all of the men on the crew were held up until the bore was made. There was no time lost on the bore on the mechanized crew because both men were needed on the machine, however long it took to make the bore. *The difficulty of the bore would be the same on either crew.* Some time may be saved with a good backfilling machine and tamping machine for the third crew. Assuming we could operate with two men on the head crew, two men on the specialty boring crew, and three men on the backfill crew which seems reasonable, the total integrated time to complete the service as shown on the chart would amount to six and three-tenths hours.

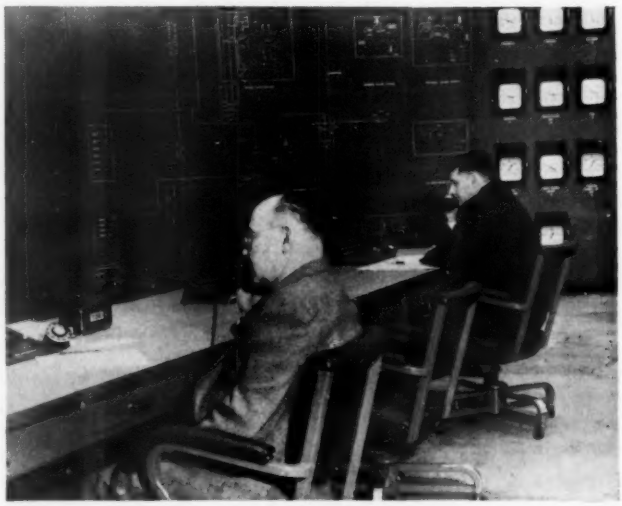
We have a total available time for the seven men shown of 49 hours a day. If the jobs are proportioned correctly, if our crews are synchronized, those seven men, then, should be able to turn out about seven services, which is a service per man day or double the rate shown on Chart 3. We strongly suspect, however, that the digging crew will be able to dig more than seven services per day, in which case it may be necessary to build up the units which follow. The boring crew has one advantage in that not all of the services will have to be bored. About half will be "short side", which will not have to be bored. We believe the last crew, the installation and backfill crew, has a better chance of completing the seven services than the boring crew has of making seven bores. The digging and welding should be easy for the head crew. The saving will not be in the proportion shown; that is, if the output is doubled, we cannot expect the cost to be halved.

Not all of our work will lend itself to this type of operation as some will be rocky services from end to end which will require hand work. Others will be in difficult alley positions where paving will be a problem. However, if we can select half of our services for this production work and, if, instead of cutting the cost in half, we could reduce it, say by 30 per cent, the saving on our North Bay division would be rather impressive. North Bay division runs 4,000 services a year at a cost of approximately $300,000. So, a saving of 30 per cent on half of this, would amount to $45,000 per year for one division.

We are hoping that another benefit will accrue on the reduction in the cost of equipment. To start this plan, of course, will take some new equipment, but it would seem that the revised plan as shown on Chart 4 would spread the work over enough of mobile vehicles so that there would be no necessity for the old time crew truck which becomes a traveling warehouse and field headquarters for the field crew. We are hoping trailers will lend us sufficient space to carry the tools and the equipment necessary. There would be three pieces of equipment, a light mobile trencher which certainly could carry two tool boxes of, say, ten cubic feet capacity, a tow truck to tow the portable trailer compressor, or in case a compressor were mounted on a truck, which would be preferable, an extra trailer would be available there and the tool boxes on the sides of the compressor would be available for the boring machine and equipment. The last crew, three men, would have a light mobile backfiller which could tow a trailer and would have room for tool boxes on the backfiller itself besides those on the trailer. The trencher of the head crew, of course, would have to pull a pipe trailer which would furnish plenty of room. With this much available space, and by standardizing the job and by eliminating excess material, carrying only enough for our work, it would seem that the field truck and the service body would be unnecessary. Our service bodies are costing us from $1800 to $2200 without the tools, and about a $2500 truck is necessary on which to mount the body. This cost, we believe, could be obviated by the specialty equipment that we propose.

PART 2 WILL APPEAR IN MAY.

Westchester Lighting Has New Nerve Center For Improved Control of Operations



Desk from which operations of electric and gas distributing stations are co-ordinated. Diagram and instrument board in background give up-to-the-minute information on operating status of the system.

A new county control center for the gas and electric distribution systems of Westchester Lighting Co. has been opened in the general office building of the company at Mt. Vernon, N. Y. The center consists of two large rooms, one of which is occupied by the district operator and gas dispatcher, and the other by a radio dispatcher and his assistants.

On the main wall of the dispatching room is a large curved diagram of every gas and electric line, every sub station and every transmission and distribution line, switch or gas valve in the county. On the gas side, remote pressure gauges give continuous readings of gas transmission system pressures at each of 11 districts that comprise the Westchester system. The recording meters, now located at the district stations will also be connected and added to the board.

In a room adjoining the dispatching room, the radio dispatcher is located. Here the work assignments of gas and electric emergency crews are directed and co-ordinated. At present, 50 of the company's 250 trucks are equipped with two-way short-wave radio. By means of a magnetic map, over which company service trucks are moved in numerical symbols, the dispatcher has visual information of the location of all rolling stock at all times. Of two and a half million truck miles utilized in maintaining service in 1949, the company estimates that the radio dispatch system, put into operation March 13, will save at least ten per cent a year.

An additional feature of the new system is a microfilm file of all of the service cards from every district. By use of this record, viewed on an enlarging screen, the dispatcher can advise any service crew by radio or telephone, the exact location of the curb valve, size of the service line, and the pressure in the distribution line.

The control system, and the procedure whereby it is operated, were designed and installed under the direction of chief engineer E. H. Carr, assisted by H. C. Otten, general superintendent, and C. B. Spates, gas engineer.

Proposed Pipe Line to Bring Natural Gas To Cities of Venezuela

A typical scene in modern Venezuela

Caracas—one of the cities which will get natural gas service

A NEW natural gas pipe line, the first of any appreciable size to be constructed in the country, will bring natural gas from the Venezuelan Atlantic Refining Co. fields in Guarico, 90 miles southeast of Caracas, to the cities and industrial centers of northern Venezuela, under a plan now being actively advanced by the Venezuelan Atlantic Transmission Corp., a new company organized in January of this year.

The transmission corporation is incorporated in Delaware, USA, and domiciled in Venezuela. The majority stockholder will be the Atlantic Refining Co., with remaining stock owned by individuals in the United States and Venezuela.

The proposed natural gas pipe line will extend from gas fields owned and controlled by Venezuelan Atlantic Refining Co. in the state of Guarico to the cities of Caracas, La Guaira, Maracay, and Valencia. Natural gas by the millions of cubic feet is now being flared in the fields in which the line will originate. Huge reserves adequate for many years are already proved in this area.

At the outset only industrial customers will be served. These industries include electric generating stations, cement plants, steel fabricating plants, brick and tile manufacturers, sugar producers, breweries and rum distillers.

At a later date entry will be made into the domestic and commercial markets of Caracas, La Guarira, Maracay, Valencia and many smaller communities.

The consumption of natural gas expected in the first full year of operation has been estimated to be 7,000,000 Mcf. The pipe line will be approximately 225 miles long, and 12″ to 16″ diameter pipe will be used. No compressor stations will be required during the early years of the project, as the gas pressure in the fields will be sufficient for the transmission of gas requirements. Contrary to United States practice, much of the pipe line will be installed above ground.

The tentative route of the pipe line has been selected, although detailed survey has not yet begun. A contract has been drawn between Venezuelan Atlantic Refining Co. and Venezuelan Atlantic Transmission Co. for the purchase of necessary gas. Prospective customers of the pipe line have been contacted and sales contract forms have been submitted and are at present being negotiated. It is expected that construction will commence on or about the first of October 1950. Approximately eight months will be required to complete the line.

Government subsidized housing is replacing former slum districts

Venezuela has a total area of approximately 352,000 square miles, which is greater than the combined areas of Texas and Oklahoma. Its population is in excess of 4.25 million. The climate is tropical in the coastal and interior sections with temperate climate in the mountainous areas. Although theoretically a republic, Venezuela is now governed by a three man military Junta headed by the President, Col. Delgado Chalbaud. This government has begun an extensive program of modernization of housing, transportation and recreational facilities, and is encouraging investment of foreign capital in new industries designed to create a more balanced economy.

At the present time virtually the only major industry in Venezuela is petroleum. Ninety-five per cent of the exports are in petroleum and petroleum products. Income from the petroleum industry has made Venezuela one of the few nations of the world with neither internal or external debt.

The cities of Venezuela present strik-

(Continued on page 44)

1 - Standards and Methods Of Quality Control

By P. H. Miller

Superintendent of Measurement, Texas Eastern Transmission Corp.

THE transmission system of Texas Eastern Transmission Corp. consists of the 24″ "Big Inch," which begins at Longview, Texas, and extends approximately 1254 miles to the town of Eagle, near Philadelphia, where it connects with a 20″ line which continues to Linden, N. J., a distance of 86 miles. The 20″ "Little Inch" begins at Beaumont, Texas, and extends to Little Rock, Ark., where it joins the right of way of the 24″ line, and continues on to Linden for a total distance of approximately 1479 miles. Lateral lines from the main pipe lines serve Philadelphia, New Jersey and New York City areas. Appended to this system are appropriate gathering lines in the producing fields.

The gas transported by Texas Eastern is purchased from suppliers through long-term gas purchase contracts and withdrawn from 19 separate natural gas producing reservoirs in Louisiana and Texas.

Gas purchase contracts from the producers require that gas delivered into Texas Eastern lines meet the following standards of quality:

(1) Shall contain 1000 or more Btu per cu. ft.

(2) Shall contain not more than 7 lbs. of water per MMcf.

(3) Shall contain less than 1 grain of hydrogen sulphide and not more than 20 grains of total sulphur per 100 cu. ft.

(4) Shall not contain in excess of

(a) 3 per cent by volume carbon dioxide

(b) 1 per cent by volume oxygen, and

(c) 0.2 gallons per Mcf gasoline content

(5) Shall be free from objectionable odors, dust, liquid or other gaseous matter which might interfere with merchantability of the gas.

By keeping gas up to these standards of quality, we eliminated stoppage or restrictions in our facilities or in the facilities of our customers, and we are in a position to meet the quality obligations of our gas sales contracts.

Routine periodic quality measurements of gas purchased are made in the field by measurement engineers and written reports of all tests and inspections are mailed to the measurement department, general office. Handling of all unusual circumstances concerning the quality of the gas is co-ordinated by a general office measurement engineer assigned to quality control and related measurements. Among the many quality tests conducted, the determination of water vapor content is one of the most important. The results of regular daily water vapor content tests conducted by operating personnel at pump stations are reported to the gas dispatching department by company phone and they, in turn, report any increase in water content to the measurement department for further investigation. If investigation proves that the water content of the gas from any certain supplier is more than 7# per MMcf, the dispatchers reduce the rate of gas take from the offending supplier until the reason for the high water content can be determined and eliminated.

Not only excess water, but all "off quality" findings are reported through the dispatchers, to expedite handling. This close cooperation between the dispatchers and measurement personnel is an invaluable aid in maintaining proper control over the quality of the gas transported.

With continuous and accurate information concerning the quality of the gas, coupled with the known velocity in any portion of the pipe line system, changes in the quality of the main line gas throughout the system can be predicted at any time gas purchased at any location is found to be "off quality." The average velocity of our main line gas stream is in the neighborhood of 15 to 17 miles per hour between the gas purchase fields and western Pennsylvania and about 3 to 5 mph from there to the eastern terminus of the system.

Once a year a chemical (distillation) analysis of a representative sample of the natural gas obtained from each gas purchase connection is made. Monthly analyses are made on the main line at three locations. These analyses include the carbon dioxide and nitrogen content, and the hydrocarbons through the heptanes. A typical analysis of the main line stream, taken recently in Ohio, is:

Analysis	MOL %
Carbon Dioxide	1.00
Nitrogen	0.68
Methane	92.95
Ethane	3.96
Propane	0.99
Iso-Butane	0.13
N-Butane	0.15
Iso-Pentane	0.04
N-Pentane	0.02
Hexanes	0.05
Heptanes Plus	0.03
	100.00

Rate schedules in Texas Eastern gas purchase and sales contracts are based upon natural gas having an average total heating value of 1000 Btu per cu. ft. The heating value of methane, the principal constituent of commercial fuel natural gas, is close to 1000 Btu. Incidentally, the heating value (30″, 60° saturated basis) of the more common components of raw natural gas is:

Component	Heating Value 30″, 60° Sat.
Methane	996
Ethane	1745
Propane	2483
Iso-Butane	3210
N-Butane	3218
Iso-Pentane	3943
N-Pentane	3955
Hexane	3691
Heptane	5425

(Continued on page 40)

NATURAL GAS IN TRANSIT

2 - Metering and Regulating For Quantity Control

By Earle N. Armstrong

Superintendent of Measurement, Transcontinental Gas Pipe Line Co.

. . . Editor's Note . . .

The companion articles starting these pages are the outgrowth of a natural gas conference recently held in New York under the sponsorship of Malcolm W. Black and Co., manufacturers representatives. The conference was a grass roots affair, designed to acquaint operating personnel of eastern manufactured gas utilities with the technics of quality control, measurement, and regulation of the natural gas to be delivered to them within a few months. Messrs. Miller and Armstrong led the seminar discussions on quality control and quantity control respectively.

Out of the questions asked by the 200 gas operators in attendance, there emerged a clear picture of the exact type of factual information most in demand. The amplified discussions here presented represent the summation of the most pertinent points raised. A third topic on the conference agenda was a discussion of the fundamentals of gas pressure regulation, led by K. R. D. Wolfe, of Fisher Governor Co. This is being compiled into a technical paper for the May issue of AMERICAN GAS JOURNAL.

THIS discussion is the design and manufacture of orifice meter and pressure control stations for Transcontinental Gas Pipe Line Company's 30" line, now under construction. The general problem concerns volume and pressure requirements for each customer and into each delivery point.

The American Gas Association, Natural Gas Division, in 1935 published a Code for Orifice Meter Measurement. This was the result of 10 years of fact gathering, along with some research on correction factors and design requirements.

At one time there were six or more sets of orifice factors and each manufacturer sold equipment designed to use his factors. The AGA work summarized all these data into the present accurate code. The factors now used are suitable for any make of instrument so long as the meter tube and orifice disc are manufactured to code standards. Their meter standards are minimum requirements; but some companies not only meet the code, they also design their stations to improve flow conditions.

Measurement by orifice meter can be quite precise. Experience has shown that lost or unaccounted for gas on new welded lines can be kept under one per cent of the total gas measured, both at individual stations and over the system, so long as two things are done: (1) Meter tubes, headers, pressure control equipment and housing must meet, or be better than, code requirements. (2) Charts must be computed daily, using AGA or better tables for correcting for specific gravities, deviations and temperatures applicable to each chart. Chart integrators, calculators and bookkeeping machines reduce computation errors to a minimum.

This will be standard practice on the Transcontinental pipe line, as it is on all the newer systems.

Deliveries of natural gas to east coast cities will be largely to gas manufacturing plants. This involves the measurement of the gas volume delivered at the pipe line pressure, and the pressure and flow control of the delivery.

Measurement Design

Customer companies have estimated their early gas takes, and contracted for certain volumes with daily variation not to exceed 10 per cent. Points of delivery fall into three classifications: gas plants, electric stations, town borders or distributing pipe line tie-overs. Each point of this kind will require a metering and regulator station, the responsibility for which will be that of the public utility. In this connection our own experience and designs may prove of value.

A meter station should be arranged for great flexibility. Orifice meters are the form of gas measurement best designed to provide easily arranged and rearranged tubes and gauges for capacities to meet rapidly expanding deliveries.

During the early months, there will be small deliveries, which will increase, as they have increased several hundred per cent in other places. Our stations are designed to provide the required expandability. Headers and valves using small diameter tubes can be changed later to larger tubes without changing anything but the orifice tube and fitting. With a range of plate sizes, many stations will require no piping or tube change. We have built the stations with two tubes, so that small flows can be metered by a small orifice disc in one tube, and peak flows with large orifice and both tubes. Wide range is provided by two tubes equipped with 50" gauges able to handle from 5" to 40" differential with five to 15 different orifice disc sizes. These operate at pressures of 275 pounds and higher. It is thus easy to provide, upon an hour's notice, the suitable sized meter for the needed delivery, with the resultant daily chart record in the middle range.

Figure I illustrates what we feel to be a useful and flexible meter-regulator sta-

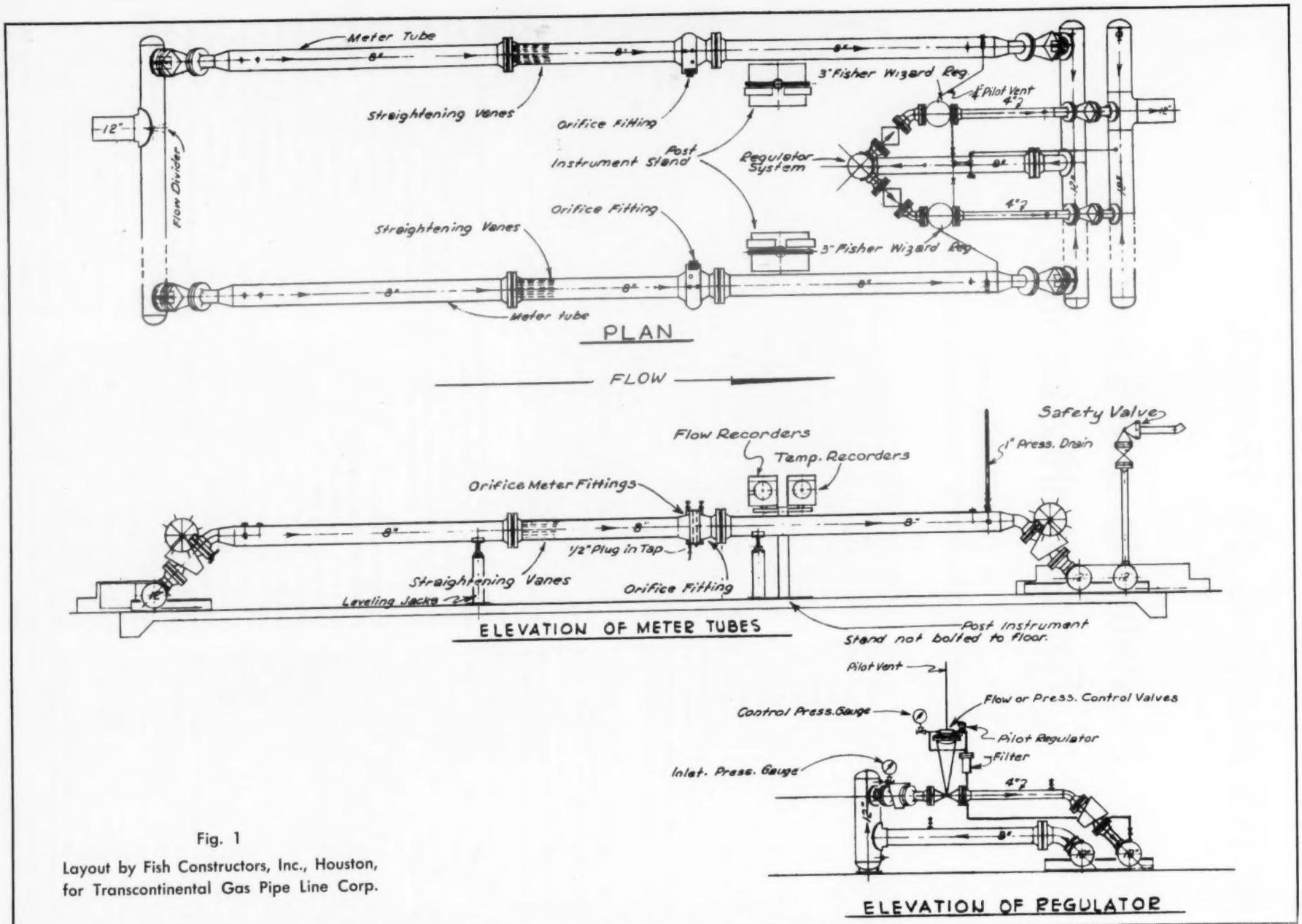


Fig. 1

Layout by Fish Constructors, Inc., Houston, for Transcontinental Gas Pipe Line Corp.

tion which will become the basis of our standard design.

The station is a unit. It provides for a shop-built skid-mounted piping plan of three or four headers, two orifice meter tubes with orifice fittings, and with a dual pressure control valve assembly between the tubes. Hand valves are arranged so that either one or both tubes can measure gas, passing it through the headers to any pressure control valve. This makes for flexibility and easy inspection and maintenance of any part of the station. The header assemblies are made up in only two sizes, which saves money and material at the fabricating shop.

Smaller Type Station

A small sales type station is planned to handle loads of ¼ to 18 MMcf per day at the normal pipe line pressures of from 300 to 800 psig. It will be equipped with 8″ headers, 3″ meter tube valves and with either 3″, 4″ or 6″ orifice tubes as the loads dictate. The station is 32 feet long, designed for 6″ tubes, 25 pipe diameters upstream and 15 pipe diameters downstream from the orifice. Clear pipe runs are free of valves or any other conditions to cause turbulent flow.

The large type station is 45 feet long with 12″ headers, 6″ meter tube valves and 6″, 8″ or 10″ orifice meter tubes. The length provides code requirements for 10″ tubes, and better than code for 6″ and 8″ tubes. This station is for loads of 10 to 75 MMcf per day.

The small type stations can be equipped, where needed, with pressure and flow control headers and piping assembles which have 8″ headers, with 2″ hand valves in and out of the two parallel pressure reducing valves. The pressure and/or flow control valve must be sized to handle the load. This is easily done by either changing the valve and seat assembly in the large regulator body or by changing the valve body for load increases of several hundred per cent. These pressure control valves will be sized 1″, 2″ or 3″. Single seated valves will be used wherever possible and all valves will be pilot operated.

For those gas utilities handling low pressures, there are now bellows type pilots to do a precise job on from two to 10 pounds, as well as springs, which give a precise setting on up to at least 2500 pounds pressure.

Our large type pressure control assemblies are on 12″ headers, with 4″ hand valves in and out, and arranged with ells in and out for dissembly. They will carry 2″, 3″, 4″ or 6″ regulators as the loads require. By taking our controlled pressure connection off the outlet header, drop through the hand valves and connecting piping is immaterial in obtaining a satisfactory pressure.

Regulating valves are sized so that the full load through the station will be controlled by one valve. But either one or both valves can be used. Either or both respond to one pilot, with a standby pilot, or with both pilots in service, set to the same pressure. Pilots may be set staggered, so that if the first regulator fails to open enough for the load, a 10 pound pressure drop in the header will open the second valve.

The pressure control valve inlet and outlet spacing is made long so that a second valve can be used for tight shut-off or a different valve location can be made up by changing only the pipe spools. Hand valves will remain in place at all times. Thus gas service through the station will be continuous even during changes or maintenance on one of the valves.

The pilot operation of regulators and the uniform use of steel valves and flanges has removed most of the old-fashioned troubles from pressure control. A good maintenance job, complete dissembly and inspection each six months to a year is additional insurance.

Steel Only

I earnestly recommend the reasonable expense of using nothing but steel fittings, flanges, valves and regulators and of being sure that you have at least ASA Series 30 steel equipment, safe at 600 pounds, for all points of connection where natural gas is received.

Transcontinental has only these two standard stations. They are so designed that they can be set, used for a time, and reclaimed in total for use elsewhere. One now in service in Alabama on measuring and controlling tests will be reclaimed during the year. It will be loaded on one truck and taken to a purchase gas point or sales location, and there installed with little or no change.

The wide range of good measurement which can be had by changing orifice discs from 2/10ths of the pipe diameter to 7/10ths of the diameter, as provided by the code and with two tubes to be used single or both in service makes this standardization possible. Should future loads make a tube size too small, we can change to a larger size without disturbing header piping or valves.

Not all stations can be fitted into a standardized program, but to date Transcontinental has only two stations requiring special engineering design.

The Manhattan 134th street station where natural gas enters New York is one of the largest single stations in the country. Here we will use seven 12″ meter tubes to insure measuring future loads up to 450 MMcf. The station has a contracted load of 253 MMcf at present.

Another large pressure control station and check meter station for dispatch purposes will be located near Linden, N. J. It will handle 500 MMcf per day. Four 10″ pressure control valves will be required at this station for cutting 425 pounds to 400 pounds.

We also have two purchase stations which will require more than two 10″ runs. Here four 8″ runs (two standard stations set side by side) will do this job better, especially on the 1000 pound purchase pressure.

As shown in Figure I, the standard station design incorporates 45° turns wherever possible to minimize vibration and to reduce turbulence with its consequent pressure drop, noise and pipe strain. Any meter tube or pressure regulating valve can be lifted out of its flanges without strain on adjacent piping on which there will be a high pressure. Gas leaving the pressure control valve will pass straight away into the pipe line with only two 45° turns, yet the valve is up off the floor, properly supported by the piping and easily cleaned by removing either bottom flange or topwork. The central header piping to the control valve post will serve as a mount for pressure and flow control instruments.

In special cases, where it may be convenient to control pressures with only limitation of flow, we will install a Taylor booster type pilot tube in the outlet piping from the station, so that the steady pressure, together with a measured differential, can limit flow or even control flow beyond the regulators where flow rates will be steady. On the gas manufacturing plants, however, we believe it will be most helpful to take the flow control from the regular meter operating at higher pressures, even though some readjustment of the controller would be required if the pressure changed 10 per cent.

The meter tube headers are connected to the control valve assembly by flanges. When a station delivers gas to a pipe line customer where no pressure or flow control is desirable, a tie-over assembly is designed to connect the dual headers and allow reclaiming of all the pressure control valves. If future conditions make pressure control equipment necessary, it can then be installed without piping changes.

Operation Features

The pressure control assembly of dual diaphragm valves with four hand valves is arranged between the meter tubes, not beyond them. This reduces the building length. Even more important it locates the pressure pilots adjacent to the flow measuring instrument. Thus an

operating man standing at the regulator, can look across five feet to the flow chart as he adjusts flows through the station. Hence, one man can, in a few minutes, do what requires two men, or many tedious trips in the older stations to do. If the regulators are beyond the meter tubes or in a separate pit or house, they must be especially equipped for remote reading, or the man must go back and forth between pilot and flow recorder to set the correct take through the station.

No manually set station will continue to pass an exact volume without continual watching and some adjusting —whereas, an instrument does the readjusting more intelligently than an operator can. Wide pressure changes can, however, make readjustments of the instrument necessary so that it is helpful to have control board convenience, by piping arrangement, without the expense of the central board.

The floor space between the runs at the front of the house (about seven feet square) makes an ideal place for meter maintenance men to work, as they run gravity tests, clean and inspect orifice plates, calibrate the recorders, or overhaul pressure control valves. The instruments face each other between runs, on separate stands, so they are quickly accessible to the chart changer. There are no meter tubes to climb over and easy access to the building is had by doors at both ends.

Standardized Orifice Meter Tubes

The orifice fitting suppliers have been the most active in improving the industry standards and practices for gas measurement by orifice meter. They not only make a superior casting for holding the orifice disc exactly concentric in the flow, and at exact right angles to the flow, but these castings provide clear and quick access for removing the disc and for cleaning any dirt from the pipe ahead of and behind the disc.

Orifice fitting manufacturers also have equipped shops and selected pipe to fabricate complete meter runs meeting published code diameters. On our stations, two companies have competitively bid and now have orders for a special or "Transco pattern fitting." This has the inlet end beveled for welding on the primary tube and the outlet end flanged, so that the tube and fitting unit can be inspected, micrometered and removed from between the inlet and discharge tubes for cleaning the vanes and other run sections.

Our design meter tubes are in three sections: (1) The inlet section, 15 or more diameters long, to the flange holding the straightening vanes. (2) The orifice tube, or primary close tolerance tube, 10 diameters long, which carries the gas flow to and through the orifice discs. (3) The discharge tube, 15 diameters long, which carries the gas away from the disc in a straight line without turbulence. This tube has thermometer wells in the last diameter, since no code requirement exceeds 13 diameters downstream from the plate.

The tubes have 45° welding ells, and Series 40 flanges at each end, (safe for 800 lbs. working pressure) and since the tubes are symmetrical as to ells, the tubes can be turned end for end on the riser valves. Equally accurate conditions can be had by reversing the orifice tube between the two end sections, so long as the measurement is made on flange connections. This means that no header or pressure control assembly changes are necessary if it becomes useful to reverse flows through the station. Only ¼" meter gauge manifold piping changes are necessary for reverse flow measurement.

John Van Norden Dies

John Van Norden

John Van Norden, secretary and manager of sales promotion of the American Meter Co., Inc., died on March 17 in New York Hospital after an illness of several weeks. He was 55 years old and a resident of Scarsdale. Born in Groenegen, Holland, he came to this country as a young boy.

Mr. Van Norden became associated with the gas industry in 1928, when he joined American Meter Co. as advertising manager and assistant secretary. At the time of his death he was a popular figure in all phases of the industry, including the manufactured, natural and liquified petroleum gas fields.

He was a member of the executive committee and executive board of the American Gas Association and a director and treasurer of the Gas Appliance Manufacturers Association. Mr. Van Norden was a founder member of the Society of Gas Operators, and secretary of the Guild of Ancient Suppliers. He served as President of the Engineers Club of New York from 1946 to 1948 and was a member of the board of management at the time of his death.

He also was a member of Liquified Petroleum Gas Association; New Jersey Gas Association; Southern Gas Association; and Engineers Golf Club.

Pressure Control Practice

On new units the natural gas industry is standardized on pilot operated pressure control valves, made of steel, with interchangeable valve and seat assemblies that can be changed to fit the flow character. Thus, we are installing some 3" valves, with 2" or 1½" valve and seat assemblies, with the intention of inspecting these valves by complete dissembly every six months or oftener, where indicated needs arise (such as extra dirt loads). We will also increase, or if necessary, decrease such valve trim as loads increase. Hardened trim now eliminates much of the older day concern about cutting out valves in service.

Single seat valves are widely used on the high pressure control work in Texas and this practice will be applied to our intermittent service station, such as electric generating stations where deliveries may be made several weeks apart, as weather and preferred use require. Single seat valves give tight shut-off between sales.

Periodic inspection, intelligent sizing and operating of pilot operated control valves have removed most of the doubt about good regulation of gas pressures, but there are still some unexpected troubles.

No new line can avoid having some water vapor in its first gas flow. We are preparing for temporary regulation trouble for the first 90 days. We expect to use methanol, a synthetic alcohol, as a de-icing agent mixing the alcohol vapors, or even liquid, into the headers at the pressure control valves. This should break the hydrates out of the valve bodies enough to permit the valve to work. Of course, the alternate valves may have to come into use during this time, too, to permit shutting out a valve and cleaning it, or perhaps, heating it with steam to free the valve and seat.

As a generality .60 sp. gr. gas will not hydrate under the following conditions of pressure and temperature:

At 100 lbs.,
35° gas will not usually hydrate
At 300 lbs.,
55° gas will not usually hydrate.
At 600 lbs.,
65° gas will not usually hydrate.
At 1000 lbs.,
72° gas will not usually hydrate.

When Transcontinental gas, as purchased on dehydration specification with dew points well below zero, reaches the sales stations, there will be no further concern about regulators hydrating. These conditions may be reached in a few weeks, or it might be several months before the 1868 miles of 30" and 26" pipe gets really dry. After that time, good stuffing box lubrication, clean pilot regulators and tight shut-off will be our principal concern because much of the uncertainty inherent in the older type regulators is gone from the new equipment.

Coupling Dissimilar Metals Adds To Corrosion Problems

By Sidney K. Gally
Southern California Gas Co.

BARE copper tubing is now being used extensively for gas distribution mains and services, both in new installations and as a replacement for corroded ferrous pipe, because of its convenience and its superior resistance to soil corrosion. The Southern California Gas Co. now has in the ground over 700,000 feet of copper mains and more than 11,000,000 feet of copper services.

It was recognized early by those companies installing copper mains and services that the corrosion of ferrous pipe connected electrically to the copper would be accelerated. A number of tests to determine the conditions under which this corrosion might become serious were conducted over ten years ago and were described in papers by Hough, Allyne and de Jonge.[1, 2, 3]

Based primarily upon the favorable experience of others, the Southern California Gas Co. adopted the simple precaution of applying a protective coating to the pipes in the immediate vicinity of the copper-steel junction to prevent concentrated corrosion of the steel. For instance, when a copper service was joined to a steel main, three feet of the copper tubing, the service connection, and all the steel pipe exposed by the bell-hole were coated.

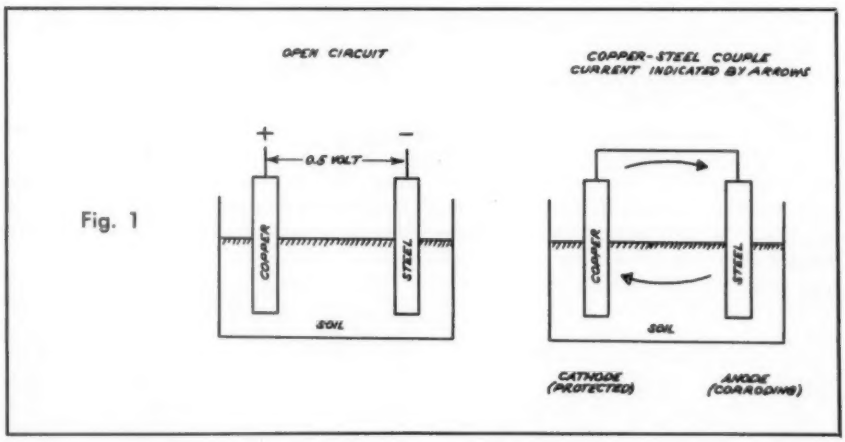
Because of the increasing amount of copper being installed underground and because of some severe corrosion attributed to it, this practice is being modified, particularly in the case of copper mains. Current practices are being reexamined, the trend being towards more electrical insulation of copper from steel.

A brief discussion of the fundamentals of dissimilar metal couple (or "galvanic") corrosion will be a background for an examination of practical problems.

Among the metals which may be encountered underground are:

Magnesium
Aluminium
Zinc
Iron (steel, cast iron, wrought iron)
Lead
Copper (brass, bronze)

Fig. 1



The closer a metal is to the bottom of this list, the more noble it is said to be; that is, the less rapidly will it ordinarily corrode.

If two dissimilar metals from the above list, such as copper and steel, are buried in soil, there will be a potential (or "voltage") between them which can be measured with a voltmeter. The metal which is nearer the top of the list will be "negative" while that below it will be "positive." In soil, copper is positive to steel by about 0.5 volt. Metals which are farther apart on the list may develop higher voltages; steel is about one volt positive to magnesium in soil. As long as the two metals are not connected to each other, neither will affect the rate of corrosion of the other, although there is a voltage between them.

When the two dissimilar metals are connected to each other through a path of low electrical resistance, an electric current will flow from the positive metal to the negative metal through the connecting path. In the case of copper and steel, the current will flow from copper to steel through the metallic connection and from steel to copper through the soil. This is pictured in Fig. 1.

Two dissimilar metals, electrically connected as above, are known as a couple. The least noble metal of the couple (steel) will be the one from which the current enters the soil. It is known as the anode and in the case of steel, it will be consumed by the electric current at the rate of 20 pounds per ampere per year. The more noble metal of the couple (copper) is known as the cathode and will pick up current from the soil. The steel will corrode more rapidly than it would by itself while the copper will corrode slower than if uncoupled. The copper will be "cathodically protected" at the expense of the steel.

The initial electric current generated by a couple is governed by the open circuit voltage and the circuit resistance. The circuit resistance depends upon the size and arrangement of metal structures and upon the resistivity of the soil. The current generated by the couple will decrease with time and will finally level off at some lower value. This fortunate occurrence is the result of "polarization" which is a change in the voltage between the metals and the soil as a result of the current flow. Polarization in a copper-steel couple occurs mainly at the copper so that the area of copper exposed to the soil tends to control the size of the current and thus the amount of corrosion of the steel.

In every case of copper connected to

Presented at Technical Services Conference, Pacific Coast Gas Ass'n, San Diego, Mar. 1950.

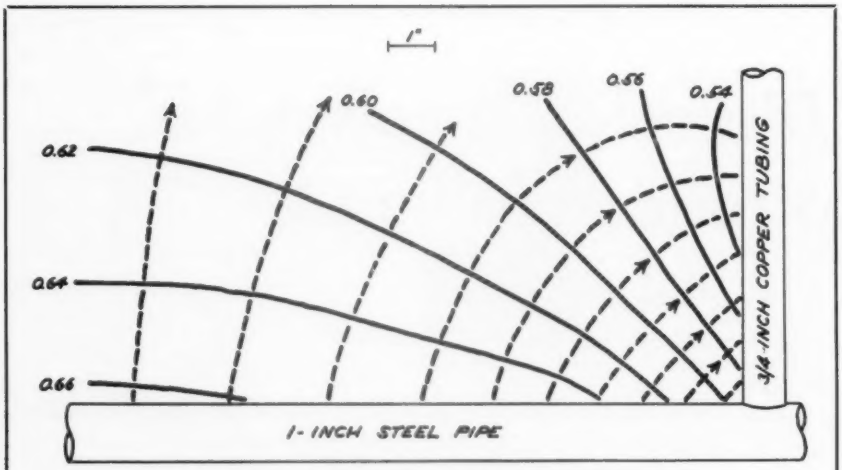


Fig. 2. Potential and current distribution in water near a copper-steel junction.

steel underground, the corrosion of the steel will be more rapid than if it were not joined to the copper. The most important criterion of whether the corrosion will be accelerated seriously is the relative areas of the two metals. If there is a large area of copper coupled to a small area of steel, the steel will be penetrated rapidly. If the steel area is much larger than that of the copper, there probably will be no danger except in the immediate vicinity of the copper. A rule of thumb is that the same amount of steel will be consumed as a result of a copper-steel couple as would be lost by soil corrosion alone if the entire area of the couple were steel. Consequently, the smaller the relative area of the steel, the more intense will be the attack upon it.

With bare metals forming the couple, the distribution of the current leaving the steel is of considerable importance. Fig. 2 shows the results of measurements made in water of 1330 ohm-centimeters resistivity in the vicinity of a copper-steel couple. The solid lines are lines of constant potential in the water. Each dashed line represents a current of 38 microamperes per inch of depth. The dashed lines are crowded together near the junction, indicating a higher current density (and consequently more intense corrosion of the steel) than exists farther from the junction where the lines are more widely spaced. At the junction, the density of the current leaving the steel is about 50 microamperes per square inch. This would corrode the steel at the rate of 0.0036 inch per year in addition to whatever corrosion would exist in the absence of the copper.

In soil of low resistivity, the total current will be high but will distribute itself more evenly, because of polarization, than in soils of high resistivity, where the total current will be low but will tend to concentrate near the junction; however, the deepest pitting will still be encountered in the low resistivity soil.

By applying a protective coating to the copper and to the steel in the vicinity of the junction, the current leaving the steel can be forced to distribute itself more evenly. The total current may be decreased only a small amount but the current density and thus the corrosion rate near the junction may be lowered considerably. This may be readily demonstrated by measurements and a plot similar to that in Fig. 2.

COPPER-STEEL COUPLES IN A GAS DISTRIBUTION SYSTEM

1. Copper Main—Steel Main Couple

Copper mains may be laid as main extensions or laterals where one end only is connected to an existing steel main. They may also be used to replace a section of steel main so that there is a copper-steel joint at each end of the copper main. More complex arrangements may also occur.

The current practice is to insulate all dead end copper mains from electrical contact with connecting steel mains by means of insulating joints. Table I gives the results of voltage and current measurements made at the insulators between six dead end copper mains and the steel distribution system. All services from the copper mains were insulated so that the entire galvanic current could be measured at the main insulators. The effect of polarization is apparent in the decrease in potential and galvanic current after 24 hours. In spite of the decrease in current, that remaining from the six 2-inch copper mains is enough to corrode 60 pounds of steel each year.

The relative area of copper and steel is an unknown quantity in most instances. If the steel system is coated pipe with imperfections in the wrapping, the copper-steel ratio may be high and intense corrosion the result. Consequently, it is recommended that except for unusual cases where it is desired to maintain a continuous drainage path for stray electric railway current, all copper mains be electrically insulated from the steel distribution system.

2. Copper Main—Steel Service Couple

This situation arises in the case of a main replacement where existing steel services are tied over to a copper main. Because of the large copper-steel area ratio, particularly if the services are imperfectly coated, intense corrosion of the services would be expected. The current practice is to insulate all such services at the service-to-main connection.

3. Copper Service—Bare Steel Main Couple

The danger area here is in the immediate vicinity of the service connection where the current leaving the steel will be most concentrated, as illustrated in

Table 1. Galvanic current developed by 2-in. copper mains coupled to steel systems.

NO.	ρ OHM-CM.	E_o VOLTS	E_{24} VOLTS	I_o AMPS.	I_{24} AMPS.	L FEET	D_{24} MA./FT.^{2}
1	1800	0.54	0.30	1.32	0.75	771	1.75
2	2000	0.50	0.25	0.62	0.30	323	1.70
3	7800	0.57	0.38	0.47	0.25	522	0.86
4	12000	0.55	0.43	0.20	0.12	209	1.13
5	1700	0.39	0.24	1.70	1.05	1952	0.97
6	1300	0.43	0.23	1.25	0.60	829	1.30

LEGEND

ρ AVERAGE SOIL RESISTIVITY
E_o INITIAL POTENTIAL ACROSS INSULATOR
E_{24} POTENTIAL ACROSS INSULATOR AFTER 24 HOURS SHORTED
I_o INITIAL CURRENT IN BOND AROUND INSULATOR
I_{24} CURRENT IN BOND AROUND INSULATOR AFTER 24 HOURS
L LENGTH OF COPPER MAIN
D_{24} AVERAGE CATHODIC CURRENT DENSITY AFTER 24 HOURS

Fig. 2. For a number of years the precaution of applying a protective coating to all exposed metal within a few feet of the junction has been followed with apparent success. Ideally, it would be desirable to insulate all such services at the service-to-main connection, for the corrosion of the steel will otherwise be increased. However, because of the large area of steel compared to that of copper, the accelerated attack is of low intensity at any point and may not be significant.

There is no clear-cut answer to this problem; probably in any soil where it is safe to install bare steel pipe, it will also be safe to install uninsulated copper services with a protective coating applied only in the vicinity of the junction.

4. Copper Service—Coated Steel Main Couple

If the coating on the steel were perfectly continuous, there would be no corrosion as there would be no galvanic current. Unfortunately, a perfectly continuous coating is seldom found; there are always imperfections which were not detected before the ditch was backfilled or which develop subsequently in the earth. With only small areas of steel in contact with the soil, the copper-steel area ratio may become very large and severe corrosion result. Paradoxically, the higher our standards of coating integrity become, the more rapid will be the galvanic attack because of the high copper-steel ratio. Such attack is not confined to breaks in the coating which are near the junction; it may also be found at coating breaks some distance away because of the low electrical resistance of the current path through the earth.

An example of the corrosion probably resulting largely from this type of couple is shown in Fig. 3. There were eight uninsulated copper services about 60 feet long connected to a dead end 3-inch steel main, 216 feet in length. The soil resistivity averaged 800 ohm-centimeters. At each break in the coating, there was rapid attack. The holes and pits in the pipe shown in Fig. 3 developed in the short time of three years.

Few measurements of the galvanic current produced by copper services have been made. In one instance, a 1-inch copper service 704 feet in length in soil of low resistivity was found to be generating a current of 0.52 ampere.

As the safest procedure to follow, it is recommended that all copper services be insulated from coated steel mains at the service-to-main connection.

5. Encased Copper Service—Steel Main Couple

A common method of replacing a corroded steel service is to pull through it a length of soft-drawn copper tubing. At each end, the copper tubing is bonded electrically to the old service, either by split lead sleeves driven into the end of the casing or by a brazed connection.

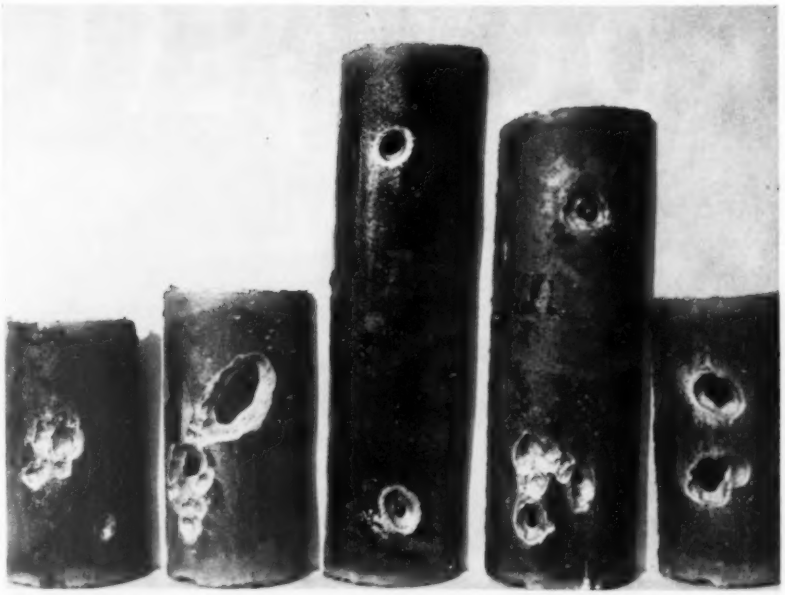


Fig. 3. Corrosion probably resulting largely from the couple between bare copper services and an imperfectly coated steel main.

The total length of copper tubing in direct contact with the soil is small. In addition, the old service, probably bare, is expected to bear the brunt of any galvanic corrosion. For these reasons and because of no adverse experience, the current practice is to connect the copper service directly to the service tee and to apply a protective coating only in the immediate vicinity.

6. Copper Gas System—Cast Iron Water System Couple

Many electrical connections exist between the gas and water systems, the most common being at gas-fired water heaters in houses served by both systems. When copper gas mains have been insulated from the gas distribution system as described earlier, there still may remain a galvanic couple between the copper gas main and the water system, the connection being made by their respective services at the water heaters.

The current developed by such a couple was measured at the same time the data presented in Table I were obtained. The current in single services from mains No. 5 and 6 was measured while the mains were insulated from all other structures. The measured currents were 0.95 and 0.92 ampere respectively.

The current from this couple will spread out over the large area of bare metal in the cast iron water system and it is unlikely that it will accelerate the corrosion of the cast iron pipe significantly.

A couple between copper services and the water system may also exist even when they are insulated from the steel gas mains. The current from a service would be small and would not concentrate at any point on the bare cast iron water mains.

The current from such couples could be interrupted by means of insulators in the piping, should it be necessary in any particular case. It is understood that in the South, those gas companies which insulate their copper services at the service-to-main connection do not provide an additional insulator at the meter.

Embarrassing Questions And Attempts To Answer Them

Question: Why hasn't trouble developed in cases where the precautions recommended, especially that of insulating copper from steel, have not been followed?

Answer: (a) Many installations are in soil of relatively high resistivity where the total galvanic current is low and the corrosion therefore slow.

(b) Sufficient time has not elapsed for the accelerated corrosion to make itself known by leakage.

(c) The many connections to the bare cast iron water system provide alternate paths which dissipate some of the galvanic current that would otherwise discharge to earth from the gas piping.

Question: If copper mains and services are electrically insulated from the steel distribution piping, they will lose

(Continued on page 26)

ROCKWELL-EMCO

Made with Pressure Cast Aluminum Alloy Housing

Try it!

No. 00 Rockwell-Emco meter, top connection model. Side female tapped connection style also available.

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ROCKWELL MANUFACTURING COMPANY
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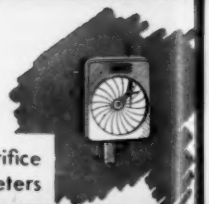
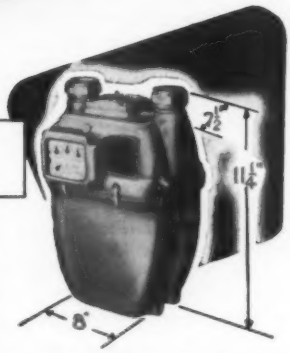

Orifice Meters

No. 00 METER

. . . for WEIGHT

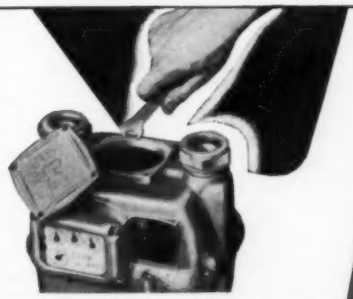
The Rockwell-Emco No. 00 meter weighs but 11½ lb; about one-third as much as an iron meter of equivalent capacity. These meters are easier to handle; cheaper to install since no special hangers or brackets are required. They cost less to ship.

. . . for SIZE



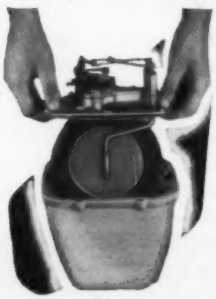
This meter measures only 8 in. wide by 7½ in. deep by 11¼ in. high. When coupled with a Rockwell-Emco Ejector service regulator and Nordstrom Lock Wing service cock you can install the entire assembly within a two foot square area. On apartment house settings you can work a bank of No. 00 meters into half the space previously required.

. . . for CONVENIENCE



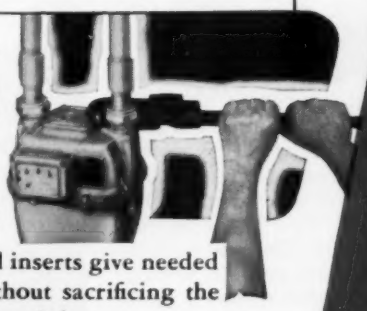
Your meter shop men are only four screws away from tangent adjustment through the convenient hand-hole plate in the cover.

. . . for service ECONOMY



Remove only a few screws and you can lift the entire valve plate and diaphragm assembly from the meter body as a unit. Thus, after a period of years, the entire working mechanism can be renewed by simply inserting a factory fresh or repaired mechanism in the old body. This feature speeds meter maintenance. It is particularly valuable to those utilities having limited repair facilities.

. . . for STRENGTH



The No. 00 outer housing is pressure cast from a special aluminum alloy having high fracture resistance and great impact strength. Steel spud inserts give needed thread strength without sacrificing the advantage of a lightweight cover.

. . . . . THE ONLY COMPLETE LINE . . . . . .

(Continued from page 23)

the cathodic protection they would otherwise receive at the expense of the steel. Copper tubing, with its thin wall, cannot tolerate much corrosion. Will corrosion of the copper tubing be increased by insulating it from the steel?

Answer: Yes, but probably not appreciably. There is very little information available on the corrosion of buried copper in this area when not connected to ferrous pipe. The National Bureau of Standards[4] has published the results of a few burial tests made in California soils in which the corrosion of copper proved to be much slower than that of steel in the same soils. The maximum pitting rate they report for copper in local soils was 0.0019 inches per year and this was in one of the most corrosive soils to steel in the country.

More data should be obtained by controlled tests on the corrosion of copper underground, both connected to steel and otherwise.

Question: Is there any danger of damaging the customer's yard piping, either gas or water, by the use of copper mains and services?

Answer: Where there is a good metallic circuit to the cast iron water mains, there probably is no danger. In the case of a non-metallic water main, or a poor electrical connection somewhere in the piping, there is a possibility of accelerated corrosion of the yard piping. Even with a good connection to the water main, if the service were copper, and the other pipe steel, and they were lying close together, accelerated corrosion of the steel might take place. While no such instances have been reported, the possibility should not be ignored. One way to avoid such corrosion would be to insert an insulator at the house meter.

Question: What about coating the copper mains and services, just as we do those of steel?

Answer: This would extend the life of the copper and eliminate any need for insulation between copper and steel piping because the area of copper exposed to the soil would always be quite small. However, this defeats one of the purposes of using copper in that part of its convenience in handling and installation comes from the absence of a coating. In addition, the cost would probably be increased to where there would be no justification for installing copper.

Spreading the Story

Many people with the responsibility of designing, installing and maintaining gas distribution systems are not aware of the possibility of accelerated corrosion caused by coupling copper to steel. This information should be made available to them.

Holes in pipe are an all-too-vivid

An Acknowledgement

Prior to 1939 our experience with sacrificial anodes for cathodic protection consisted of sacrifice of the electric railway companies' steel rails in our so-called negative electrolysis zones, caused by discharge of direct currents which the railways permitted to escape through soil electrolytes to the underground pipe and cable networks.

By Robert R. Ashline, electrolysis engineer, Department of Water & Power, City of Los Angeles, before Technical Services Conference, Pacific Coast Gas Ass'n, March 1950.

form of education. Effective demonstrations can be made with models. To do this, prepare a solution of one per cent sodium chloride, one per cent agar-agar, and one tenth of one per cent potassium ferricyanide. This solution will gel when it cools. If it is poured into a tray containing various combinations of copper and steel, a bright blue color will develop quickly wherever iron is corroding. In this manner, the results of insulating or not insulating may be compared and the effect of various area ratios may be seen.

Methods of Studying

If the actual galvanic current can be measured in a particular case, it will give an indication of how serious the corrosion might be. To obtain a true current reading, the resistance of the ammeter must be very low. Care should be taken to see that there are no shunt circuits which will carry the current when the ammeter is connected, resulting in a false reading.

The method shown in Fig. 2, that of determining equipotential lines in the vicinity of a copper-steel couple experimentally, is very useful, especially in the laboratory. The equipotential lines in Fig. 2 were obtained with a small probe from a copper-copper sulfate half cell and an electronic millivoltmeter of very high input resistance. The method of obtaining the current flow from the equi-potential lines has been described in detail by Evans[5] and Copson[6].

The results of field tests presented in Table I were obtained by B. E. Black, of the Pipe Protection Laboratory.

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The Laclede Gas Co. took the honors at the Home Builders Show held in St. Louis in February. During a nine-day period more than 100,000 people visited the company's exhibit which was based on two central themes—a fully equipped gas kitchen, and cooking demonstrations to show the desirability of such a kitchen. Preliminary advertising and publicity paved the way for the success of the exhibit.

Psychology Is Top Tool for Management In Building a Better Organization

By Dr. J. Elliott Janney

Dr. J. E. Janney

MANY times top management hears a recently promoted department head say: "Now I understand what used to make my old boss act the way he did"—or the hushed comment of the junior executive with his first big independent assignment: "Things sure look different from up here."

"Getting the feel" of the other man's problem is one of the most subtle and critical issues in building a ball team of key people. Often the home office thinks the branch office is building up an empire of its own, while the branch office sincerely and honestly believes that the home office does not understand how things are really different out in the local region. Likewise, the enthusiastic salesman frankly cannot understand why he upsets the controller by his sloppy paper work, while the engineering slide-rule artist truthfully does not see why he gets into the hair of the hard-driving construction boss.

Management is constantly puzzled by the blind spots which otherwise intelligent men seem to have in seeing for themselves the impact they make upon other people. How to get a meeting of minds between key men so they will make their heads save their heels is a constant challenge to the administrator. Experienced management soon notes that routine problems have a way of solving themselves at the lower levels of the organization when the department heads enjoy working with each other.

On the other hand, when one department begins to build itself up at the expense of other departments, top management soon finds itself spending energy and effort on internal competition which could be better spent on such external problems as public relations or the changing pattern of competition within the whole fuel industry.

Dr. Janney, of Cleveland, Ohio, is partner in charge of research and development of the psychological consulting firm of Rohrer, Hibler & Replogle, which has offices throughout the country.

Each president has in his most prized collection of happy memories instances when an individualistic department head "got the big picture" so that he happily joined the team instead of continuing to play to the grandstand. The seasoned administrator also recollects the many ingenious short cuts developed during an emergency when key men forgot their personal ambitions and individual preferences to work together for the good of the company as a whole. When men think of the company first and their own pet schemes second, there is a free and easy cross-fertilization of thinking which fosters a rapid growth of ingenuity, enterprise and resourcefulness. Likewise, the key men themselves look back upon such peak points of cooperation as the times when hard work was really fun, as each of them thought of the team first and themselves last.

Skillful administrators are constantly looking for better ways of getting strong subordinates to see through each other's eyes and listen through each other's ears. In developing this reciprocal understanding and appreciation for each other's strengths and weaknesses, management is constantly impressed by the difficulty of getting men to understand themselves so fully and completely that they see for themselves the effect they have on other men and take the appropriate remedial action.

At times some men are forced to take a fresh look at themselves by a personal catastrophe such as a failure to close a deal which formerly looked certain, or the souring of a close personal friendship, or the failure to gain a coveted promotion.

The company president with years of experience of living with strong men who have rough spots knows very well why even their best friends won't tell them. A three-way mirror where executives can take a look at themselves and then have their work clothes cut to fit has long been a critical need of business administration. In recent years, clinical psychologists working with top management have developed ways and means whereby key men look themselves over, organize their own self-development and at the same time enjoy the increased personal responsibility for helping general management in building the company ball team. When strong men can see for themselves what their personal strengths and weaknesses may be, the underbrush is cleared from the field of action and top management has a clear field for building a better team. Several hundred companies in such industries as steel, durable goods, metal working, natural gas, food processing, insurance, etc., have been using for a number of years the services of the clinical psychologist as a catalytic agent in aiding strong men to become stronger by deepening their self-understandings so as to broaden the base for their own programs of self-improvement.

A New Approach to Team Work

Clinical psychology brings to the administrator a tailor-made approach to the problem of enhancing the ball team spirit in his organization. It holds up to each key man a three-way mirror so the man sees for himself how he looks to himself and to his associates. More important, the executive can make his own decisions as to whether or not he likes what he sees in the mirror.

Since no two men are alike, the program for self-development for each man must be geared into whatever it is that makes that particular man tick. For instance, a young and able assistant vice-president in sales was over anxious for immediate promotion and was showing great resentment at the promotion of an older and abler man. Although the youngster was given assurances that his promotion would come in due time, he was such an eager beaver that he began to prepare to resign. The psychological consultant, noting that the man was

quite sports minded, asked him how important the good opinion of key men in customer organizations was to him. The reply was that their respect and good will was all important. The consultant then said: "Do you want your business friends to believe you to be a game loser"? The young man went white and silent for a few minutes and then slowly and determinedly observed: "I get it. I'll show everyone I'm a good sport." As he could then see for himself the effect he was having on other people, his attitude became more tolerant and cooperative.

In another company some of the older divisional managers who no longer expected promotions were beginning to lose zest for their work. The three-way mirror was held up to them by asking whether each man had an understudy. After each man designated his No. 2 man, the psychologist suggested they form a committee to draw up a training program for the next generation of divisional managers. As the managers wrestled with the problem of what their successors should do and be, it slowly dawned on them that they, themsleves, were not covering all the bases. As a result of their own self-discovery, something new has been added to the zeal and enthusiasm with which these older men tackle their work.

A hard-driving, executive vice-president was having difficulty in delegating to his key men, as he had convinced himself that he was indispensable. When he took a look in the three-way mirror of the psychologist, he began gradually to understand himself as the son of a ne'er-do-well father whose ambitions to succeed had been over stimulated by an ambitious mother who deeply resented her husband's failure. Slowly the inner compulsion to show the world that he was a better man than his father dissolved. As his native wit and humor then came to the surface, he began to laugh at his previous efforts to keep his fingers in every pie. When he began to take himself less seriously, his feelings of indispensability began to fade and he was able to build a ball team through proper delegation.

A "hell and holler" department head became more human when he learned to face the issue that his men thought he "was a swell fellow off the job but a so-and-so to work for." He began to see for himself that his ideal picture of an executive grew out of a small boy's admiration for "tough guys." Gradually he began to see for himself that he could be more of a "he-man" by holding steady under pressure instead of flying off the handle.

A jittery, jumpy but very able controller was keeping his accountants on edge because nothing was ever quite good enough to suit his perfectionist standards. He tried to excuse himself by saying that he drove himself harder than he did anyone else. In working his problem through with the psychologist, he found that he carried over into manhood some of his problems as a small boy. He had been the runt in a large family of rough and tumble brothers and had learned at the age of 12 to make his own way in the world. As he tried to show the world he was no runt, he succeeded only in giving other people the impression that he was a barnyard rooster trying to be a game cock. When he learned that with his superior brain he could out think his competitors, he began to feel less necessity to out-shout other people.

A ball club cannot be bought; it must be developed. Team spirit follows neither formula, training program nor pep talk. Team spirit springs from an incisive understanding of individual people plus a keen enjoyment of working with them. It is a contagion which begins at the top of the organization and spreads downward and outward in an ever expanding manner.

As the clinical psychologist gives a man the tools he needs for self-criticism and self-development, the great personal satisfaction coming from fixing oneself instead of being fixed by someone else does away with the need for a man to get his guard up.

How the Clinical Psychologist Works

Although each man is different and each psychological consultation must be tailor-made to fit the needs of the individual, some common pathways are noticeable.

1. The psychologist acts as an eloquent audience to the other man's conversation. He listens skillfully, tactfully questions the other man into self-discovery and otherwise helps the executive put his feelings, sentiments, ambitions, disappointments and hopes into words. He aids the other man to profit from getting outside himself and to take an exploratory walk all the way around himself.

2. All programs of personal development need to be hitched on to the life purpose of the man in question. The kind of a man he is now, the kind of man he is trying to be and what sort of person he wants to become must be clearly identified and woven into any remedial program. Does he want to make the sale himself or does he want to teach other men to make the sale? Does he want the limelight himself or does he want to set the stage for other men? Unless these and similar questions are clearly stated and answered by the man himself, little change in his attitude and behavior will take place.

3. As a third party, the psychologist maintains a professional and confidential relationship to the other men in the manner of the physician or attorney.

4. The aim of the clinical psychologist is much like the mountain guide who says to the "would be" mountain climber: "You must climb your own mountain in your own way. I can only help you sharpen up your *judgment* by suggesting which hand holds are safe, how to estimate the width of a crevice or where to hitch your rope."

5. Most if not all men possess the same deep-seated persistent desire to be accepted, appreciated and recognized by their associates. The psychologist at all times keeps before the other man the need and opportunity for fully realizing himself by putting the needs of the team ahead of his own pet schemes.

Psychological consultation rapidly becomes part of the everyday scenery of the job; the labels of "psychologist" and "business man" are taken off leaving two partners with their heads together over a common problem.

Using Psychological Consultation

The administrator begins consultation by giving the psychologist the big picture of the company as he sees it. He outlines the kind of organization he wishes to build for the future and describes his company's way of doing business. He paints the broad perspective of the competitive picture of the company within the industry and recounts the traditions, manners, customs, and folklore of both the company and the industry.

Each company has a different pattern of operation and each president has his own individual style of management. Yet each general management finds itself facing certain common problems. Regardless of the company or the industry, every president finds himself juggling at least six balls in the air at once. At the same time he must be prepared to have other balls tossed into his hands without warning.

Psychological consultation to management is based upon the belief that the president's job is different from any other job in the company. There is no way for the president to refer tough problems upward. He is the end of the line and regardless of the scope of the problem referred to him, he must find a way to live with it. Like the old negro preacher, the company president "unscrews the unscrutable."

More than any other man in the company, the president's job is to get work

done by other people rather than do the work himself. He sets the stage for other men to play their parts down front and in the center. As his position is the focal point of all competitive pressures both from inside and outside the company, he needs to discount the ax grinder while still retaining his own personal faith in the loyalty of his own key men.

When the administrator was a younger man, he got his personal satisfactions from laying more pipe, or selling more services or designing a better pumping station than anyone else in the company. Now as head coach for the company team, he gets his personal satisfaction from the touchdowns made by his subordinates, while he himself takes on the Monday morning quarterbacks from the newspapers, stockholders and the government agencies.

The president can live in every room in the house with his business family except one room, but in that room he lives alone. There are always certain issues which he cannot confide in even his most trusted subordinates nor can he discuss them with his competitors. Learning "to live alone and like it," tests all of the personal resources of the man who becomes top man on the totem pole.

As an able executive climbs the organizational ladder toward the president's office, he finds that with each promotion he spends less and less time on technical relations and more and more time on human relations, until, as president of the company perhaps 90 per cent of his time is in handling people while the remaining 10 per cent of his time is taken up with technical issues.

It is all in a day's work for top management to devote much of its time and energy in getting the precision minded accounting man to look over the top of his books at some of the basic financial problems of the company, of getting the highly creative engineer to come down to earth long enough to get a proposition engineered for production, or in getting the volume minded salesman to appreciate the importance of a profitable operation. Younger subordinates are naturally highly competitive and those who are worth their salt are all bucking for promotions. How to keep their enthusiasm at high pitch yet getting them to pull together is a persistent problem of all management.

As the president looks down the road to the kind of organization he wishes to bequeath to the next generation of management, he uses the clinical psychologist as a sounding board for his ideas. As he is in the most isolated position of all, he also makes use of the three-way mirror in evaluating the impact he makes on other people. One president with a brilliant, analytical mind but a shy, retiring disposition was plagued by stage fright in his public appearances. He learned to increase his self-reliance by having the psychologist play the role of an audience as he prepared his speeches. By practicing upon a skilled listener whom he trusted as guide, critic, and friend, he was able to convince himself that other people had a genuine respect for his thoughts.

Another president came to the realization that it was possible to put an inspector on every man in the organization except himself while he was the only man in the whole shop who had to be his own inspector. As he began to develop various ways and means for inspecting himself and his work, he tossed his methods to the psychologist who raised such questions as "if you approach that problem in that way, what effect will it have on the branch managers?" or "if you announce that organization change at that time, what interpretation will so-and-so place upon it?" Leading questions directed at self-evaluating the possible impact of certain moves upon other people aided the president in refining his own ways and means for inspecting his own work.

Laying Foundation for Next Generation of Management

J. P. Morgan, Senior, once remarked that a good organization needs only to hire a new office boy if and when the president dies because each key man has an understudy who can move up to the next job. As the gas industry has long been concerned about its proved reserves of natural resources, it is now becoming even more concerned about its proved reserves of human resources. Psychological counsel to management provides an orderly and systematic way of determining in advance what a key man's job ceiling is likely to be. It earmarks for more rapid development those

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Natural Gas Convention Will Be Held in Tulsa, May 8-9

The Spring Conference of the Natural Gas Department, American Gas Association, will be held at the Hotel Mayo, Tulsa, Okla., on May 8 and 9. Reserves, rates and research will be three of the several important subjects to be discussed. Paul R. Taylor, vice-president, Stone & Webster Service Corp., is chairman of the program committee.

Delegates will be welcomed to Tulsa by Roy Lundy, mayor of the oil capitol, at the opening general session on Monday, May 8. D. A. Hulcy, President, Lone Star Gas Co., and director, Natural Gas Department, AGA, will preside at both general sessions, and will deliver the opening address on Monday.

Elmer F. Schmidt, vice-president, Lone Star Gas Co., is chairman of the Technical and Research Committee of the Natural Gas Department of AGA, and will bring the delegates up to date on the many research projects in the program that are specifically devoted to natural gas.

Overlapping boundaries of regulation between federal and state commissions, and recent court and commission decisions which have had a heavy impact on the rapidly expanding natural gas business will be discussed by Wesley E. Disney, counsel, The Independent Natural Gas Association of America.

Hugh H. Cuthrell, vice-president, Brooklyn Union Gas Co., and President, AGA, will be the opening speaker on the second day of the conference. He will point out some of the ways in which AGA is working to keep abreast of economic changes.

N. C. McGowen, President, United Gas Pipe Line Co., and chairman of the AGA Reserves Committee, will bring to the delegates some of the highlights of the report of natural gas reserves and a concise picture of the progress of the natural gas industry.

H. H. Cuthrell

D. A. Hulcy

Arthur F. Bridge, President, Southern Counties Gas Co., Los Angeles, will discuss the problem of increased costs. Guy T. Henry, President, Central Indiana Gas Co., Muncie, Ind., will speak on the effect of higher costs on gas company operations. Walter Herman, Commonwealth Services Inc., will tell how rates can help in the solution of this problem.

Oliver S. Hagerman, President and general manager, Virginia Gas Transmission Corp., has arranged for the showing of Columbia Gas System's new motion picture, "The Toughest Inch."

Afternoon round table conferences are scheduled both days by the Transmission Committee and all members of the industry interested in this phase of natural gas operations are invited to attend. The Natural Gas Accounting Committee also has an afternoon meeting at which latest accounting practices will be reviewed.

Various Aspects of Natural Gas Are Presented At Annual New England Ass'n Meeting

The mounting tempo of New England interest in natural gas matters was evidenced by the character of the program arranged for the Annual Business Conference of the New England Gas Association, held in Boston March 23 and 24. Here, over 550 gas operators and executives listened to and discussed papers on gas conversion, changeover problems, sales opportunities, financing, public relations and other aspects of industry operation, with every paper and every report oriented to the fuel revolution that the coming of natural gas is expected to precipitate in the New England area.

Sales, market promotion programs, selling practices and rates were discussed by a number of speakers, leading off with S. H. Hobson, President of the Gas Appliance Manufacturers Association. The GAMA President urged gas companies to cooperate with appliance manufacturers by setting up realistic quotas of future gas consumption, upon which the makers of equipment can predicate production of ranges, water heaters, furnaces and other appliances.

The need for better integrated dealer relations programs, and the importance of the appliance dealers in adding to the gas load, were points stressed by W. Paul Jones, President of Servel, Inc., and by R. Louis Towne, sales promotion manager of Rheem Manufacturing Co. Both speakers emphasized the necessity for more outlets for gas appliances than can be provided by the utilities, and urged that the utilities take the lead in providing what Mr. Jones referred to as a favorable "sales climate" in which dealers can concentrate on gas appliance sales and do so at a profit.

"A Green Light for the Blue Flame," D. A. Hulcy's address, in his capacity as first vice-president of the American Gas Association, presented statistics on natural gas progress, praised the AGA production, advertising and research (PAR) plan and predicted a rapid expansion of the gas industry in New England with the introduction of natural gas. The PAR plan was lauded also by R. J. Rutherford, President of the Worcester Gas Light Co., who presented the activity in terms of its dollar costs to the gas industry. Rounding out the PAR presentation, J. J. Quinn of Boston, read a paper prepared by Frank C. Smith, President of Houston Natural Gas Cpn., on "PAR Promotion in 1950." For the calendar year 1950 the advertising and promotion features of the plan will involve the expenditure of $1,058,000 as compared to $1,109,000 for 1949.

Two speakers from outside New England, experienced in both manufactured gas and natural gas operation, discussed specific aspects of the problems of changeover. From the standpoint of public relations, Howard B. Noyes, vice-president of the Washington, (D. C.) Gas Light Co., emphasized the necessity for advanced education of both company employees and customers on the problems incident to transforming a system from manufactured to straight natural gas.

Robert E. Ginna, vice-president of the Rochester Gas and Electric Cpn., dwelled particularly on the question of rates. He advocated the change to a therm billing and away from Mcf rates, in advance of the introduction of a higher Btu sendout. He also cautioned his audience against allowing low rates to get their companies into the position of trying to serve a runaway market.

The original cost accounting theory adopted by regulatory commissions is not a generally accepted accounting principle, in the opinion of T. H. Sanders, Harvard University speaker on "Corporate Accounting and the Public." The need, said this authority, is for utilities to be allowed revenues adequate to: (1) cover current costs; (2) provide for maintenance and replacement of plant and; (3) yield an adequate return on investment sufficient to attract new capital when needed.

Gas company financing to-day enjoys an enviable position, on the authority of Harold H. Young, partner of Eastman, Dillon and Company, New York security underwriters. Natural gas has captured investor imagination; lower yields are suggested for utility commons, and the market is favorable to more equity financing.

One paper on the technical aspects of natural and mixed gas operation was a contribution read by P. T. Dashiell, consultant with United Engineers and Constructors, Inc., Philadelphia. Mr. Dashiell reported on the present status of various existing and pilot plant installations in which natural gas, LP-gas or oil is being catalytically reformed in either continuous or cyclical operation. His general conclusions are that most manufactured gas companies should regard natural gas as a raw material for reforming, or mixing and that present plants should be remodelled or rebuilt to fit into such a sendout program. In conclusion, this speaker stated that although in some situations a complete changeover from manufactured gas to natural gas would be advisable, "Such situations are rare and are probably confined to those of small size."

E. H. Eacker, President of the New England Gas Association, presented an interesting historical review of the organization, pointing out that its forerunner, the New England Association of Gas Engineers, formed February 2, 1871, was the first gas association in America.

NEGA Officers

Front Row (l. to r.) —John A. Hiller, incoming President, Portland; E. H. Eacker, retiring President, Boston; Gordon G. Howie, 1st vice-president, Cambridge.

Back Row (l. to r.)— Sherman R. Knapp, 2nd vice-president, Hartford; Otto Price, treasurer, Boston; Clark Belden, clerk.

Clark Belden, Executive secretary of the association delivered his annual report on "The Association's Year." During the past year the NEGA has conducted 38 meetings, under the auspices of 16 different program units, drawing a total attendance of 3,386 for the biggest attendance year in NEGA history.

Election of officers follows:

President: John A. Hiller, sales mgr., Portland Gas Lt. Co.; *1st vice-president:* Gordon G. Howie, vice-pres. & gen. mgr., Cambridge Gas Lt. Co.; *2nd vice-president:* Sherman R. Knapp, exec. vice-pres., The Conn. Lt. & Pr. Co., Hartford; *Treasurer:* Otto Price, vice-pres., Boston Consolidated Gas Co.; *executive secretary (Clerk):* Clark Belden, The New England Gas Assn., Boston.

Elective Directors: Peter A. Anderson, Pres., Utilities Distributors, Inc., Portland; Harold E. Ayer, asst. to gen. mgr., Lynn Gas & Elec. Co.; John J. Dowling, vice-pres., gas operations, The Conn. Pr. Co., New London; Fred H.

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New York Commission Decides Pensions Are Part of Employee Compensation

THE Public Service Commission of New York on March 13 announced adoption of a general policy with respect to treatment of employee pensions on the books of utility companies under its jurisdiction. The Commission was divided on the question by a vote of four to one.

An opinion by Commissioner Spencer B. Eddy stated that employee pensions can no longer be regarded as "gifts" or "favors" but must be treated as part of the employees' compensation and allowed as a current operating expense in providing utility service. Since pensions are to be regarded as a part of wages, the opinion states, a company claiming the pension as an operating expense will be irrevocably committed to the obligation and title will have passed to the beneficiary. Chairman Benjamin F. Feinberg and Commissioners Glen R. Bedenkapp and Francis T. Mylott concurred in Commissioner Eddy's opinion.

Commissioner George A. Arkwright, dissenting, stated in a memorandum that he is in favor of employee pensions. He pointed out that under the principles set forth by the majority of the Commission, the cost of pensions for services rendered by employees in the past will be reflected in the rates of present and future consumers of utility services. He believes that the cost of pensions for past service should not be passed on to the public and that the Commission's accounting rules in the past did not prevent a utility and its employees from setting up a retirement plan for past service by contributions among themselves without passing on such costs to the public.

Under the principles set forth by Commissioner Eddy, a pension plan, the cost of which is subject to disposition under rules prescribed by the Commission, must be reasonable and carry with it assurance that obligations created under such a plan will be met.

Commissioner Eddy held that the treatment of pensions on a sound basis in the light of current social and economic thinking on the subject is essential in the interest of good relations between utility managements and employees.

Commissioner Eddy's opinion cites a decision of the Circuit Court of Appeals in which the court held that the term "wages" must be construed to include forms of value like pensions and insurance benefits which may accrue to employees out of their employment relationship. He also refers to modern accounting practice as enunciated in a statement by the American Institute of Accountants to the effect that cost of annuities based on past services should be allocated to current and future periods, and that such costs should not be made a charge to a company's surplus.

After reviewing the question of employees pensions and citing the pronouncements of authorities on the subject, Commissioner Eddy's opinion sets forth four fundamental principles, covering in a general way what the policy of the Commission should be with respect to this matter, as follows:

"First: If we are to treat pensions as a part of wages, it is essential that the company claiming the deduction as an operating expense will have irrevocably committed itself to the obligations. Title must have passed to the beneficiaries.

"Second: The pension plan must be a reasonable one, carry with it the assurance that the obligations which it purports to create can and will be fulfilled and meet the standards of this Commission. If pensions are wages, the matter of pensions is a matter of collective bargaining between the company and its men over which we have no control. However, in a rate proceeding where payments are excessive, while we cannot fix the compensation, we can disallow excessive payments for the purpose of fixing rates. It follows then if pensions are part of compensation, unreasonable payments should likewise not be allowed as a part of operating expenses.

"Third: The inclusion in operating expenses should, of course, be made in the year when provisions should be made for it. The definition of the proper

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New Consolidated Edison Contract with Union Includes Pension Agreement

Consolidated Edison Co. of New York, Inc., and the Utility Workers Union, CIO, announced on March 16 that they had just signed a two-year collective bargaining contract.

A. Augustus Low, Consolidated Edison vice-president in charge of industrial relations, and Patrick J. McGrath, chairman of the Joint Council of the union, explained that the new contract included important wage adjustments, particularly in connection with periodic increases to employes, and provided for a reopening as to wage matters for the year 1951. They explained also that during the term of the contract both the company and the union would jointly seek to evolve a method of funding pensions.

Mr. Low stated that, following discussions which had been going on during the course of the past year with union representatives, the company also proposed to make substantial improvements in its retirement plan, which is financed entirely by the company. These include the establishment of a minimum pension of $125 for age retirements after 30 years' service and $100 after 25 years of service and proportionately lesser minimums for those with shorter service. These changes will apply to those persons on the present retirement rolls of the company as well as to those retired in the future.

Messrs. Low and McGrath also stated: "We believe the agreement signed today is sound and constructive and again demonstrates that the management of Consolidated Edison and the union representing its employes can, by working together, solve their own problems and meet their joint responsibilities to the people of New York. We want to add that we both appreciate the realistic and statesmanlike approach of the representatives of both parties throughout these negotiations."

Index of Yields : Selected Utilities Stocks

	Mar. 1950	Feb. 1950	Jan. 1950	Dec. 1949	Nov. 1949	Oct. 1949	Sept. 1949	Aug. 1949	July 1949	June 1949	May 1949	Apr. 1949
Natural Gas Transmission Companies	4.57%	4.83%	5.02%	4.75%	4.85%	5.15%	5.25%	5.38%	5.53%	5.82%	5.23%	5.11%
Natural Gas Transmission & Distribution Companies	5.19	5.26	5.23	5.26	5.58	5.61	5.73	5.62	5.72	5.97	5.55	5.15
Manufactured & Mixed Gas Companies	4.71	4.75	4.62	4.75	4.94	5.07	5.16	5.40	5.22	5.46	5.30	5.30
Class "A" Electric Companies	5.15	5.38	5.40	5.48	5.49	5.53	5.58	5.74	5.86	6.02	5.70	5.71
Class "B" Electric Companies	5.42	5.37	5.47	5.68	5.77	5.96	5.72	5.89	6.02	6.05	5.75	5.89

Method of Compiling Index of Yields

This is a straight arithmetical index of comparative yields obtainable on a selected group of gas and electric utility industry common stocks.

The companies comprising this index have been selected by the AMERICAN GAS JOURNAL as providing a representative cross-section of each industry, from the standpoint of geographical diversification and of the relative importance of the individual companies in their areas.

No effort has been made to weight the average to give effect to changes in capitalization or in dividend rates because the yields afforded on the issues reflect such changes. The index is designed to show the rate of return and not necessarily market movements on the stocks comprising it.

The companies used in compiling this index are:

Natural Gas Transmission Companies: El Paso Natural Gas Co.; Northern Natural Gas Co.; Panhandle Eastern Pipe Line Co.; Southern Natural Gas Co.; Tennessee Gas Transmission Co.

Natural Gas Transmission and Distribution Companies: Columbia Gas System, Inc.; Consolidated Natural Gas Co.; Lone Star Gas Co.; Oklahoma Natural Gas Co.; Pacific Lighting Corp.

Manufactured and Mixed Gas Companies: Bridgeport Gas Light Co.; Brooklyn Union Gas Co.; United Gas Improvement Co.; Peoples Gas Light & Coke Co.

Class "A" Electric Companies: Boston Edison Co.; Commonwealth Edison Co.; Houston Lighting & Power Co.; Southern California Edison Co., Ltd.

Class "B" Electric Companies: Dayton Power & Light Co.; Hartford Electric Light Co.; Pennsylvania Power & Light Co.; Public Service Co. of Colorado; San Diego Gas & Electric Co.

FOR the first time in months no change in dividend payments has taken place in any segment of the AMERICAN GAS JOURNAL index. This has combined with continuing demand for equity securities to bring yields close to the lowest point reached in recent years.

It is significant, too, that the return of 4.57 per cent afforded on natural gas transmission company stocks and of 4.71 per cent obtainable from manufactured and mixed company issues is well below the 5.29 per cent yield basis on which all utility operating company common stocks currently are quoted. Stocks of the natural gas companies combining transmission and distribution facilities afford a return just slightly below the industry-wide figure.

On heavy volume, the accepted stock market averages have moved up to a point where the utility issues now are at the recent year high attained in June 1946, and industrial issues are only a couple of points away from the level reached at that same time. In fact, the utility averages at the time of this writing are only a little more than half a point below their November 1931, quotation.

As the market reaches these former high levels, it is becoming increasingly selective on the basis of yield and all other "known" factors.

Several factors indicate continuing and possibly greater favor for gas industry equities. Profit margins to date this year have been bettering those of a year ago for companies which have reported. For the balance of the year earnings in the natural gas division should have the benefit of new facilities added in 1949, particularly if they should be aided by more favorable weather conditions.

John F. Falvey

Financial Editor Falvey's Index of Yields, previously presented in a chart, will now be given each month in tabular form as it appears at the top of this page.

Realism of the natural gas company managements is attested in the move now being made by a number of leading companies to increase selling prices for gas to compensate for rising field prices. Even with this, the natural fuel should retain its competitive price advantage in view of the hike in soft coal prices in many areas where both fuels are competitive.

A substantial proportion of the recent sharp increase in trading volume for common stocks to a new high figure since 1937 is accounted for by institutional buying, according to estimates recently made by an authority in the field. Investment companies may expand their stock purchases by a minimum of $200 million a year above their present level. Realization of such a goal would combine with increasing stock purchases by colleges and by growing industrial pension funds to narrow the gap now existing between yields on common stocks and the approximately 3.80 per cent afforded on preferred shares.

Common Stocks May Save American Colleges

THOSE people entrusted with college endowment funds recently have been placing increasing emphasis on common stocks as a medium of investment.

This step has not been one of choice but has been forced by the need to bolster income to counteract the sharp rise in every classification of cost entailed in running institutions of higher learning.

One out of every five colleges now is reported to be operating at a deficit and qualified observers estimate that within another year nearly three out of five colleges may be losing propositions.

No less an authority than Dr. Henry M. Wriston, President of Brown University and head of the Association of American Universities, is author of the statement that: "American colleges and universities face the greatest financial crisis that they have experienced in the last 50 years."

Substantially the same opinion is expressed in the 1949 annual report of John P. Chase, treasurer of Wellesley College. "Deficits of the past five years have reached the staggering total of $526,619," he said. "Fortunately," he

(Continued on page 39)

New England—the New Natural Gas Frontier Rate-Wise and Otherwise

By Robert E. Ginna
Vice-president, Rochester Gas and Electric Corp.

THE coming of natural gas to New England is as epochal as that historic Plymouth event of some 330 years ago. Coincidentally, at about that time, Sir Francis Bacon said, "If a man will begin with certainties, he will end with doubts; but if he will be content to begin with doubts, he shall end in certainties." Natural gas looms on the horizon like a new day and full of the new day's forthcoming uncertainties.

Generally speaking, the gas industry has rightly been concerned about holding the gas cooking load, and in this New England has been perhaps more concerned because of the added problem of kitchen heating. In contrast with this there has been an indifference in promoting automatic gas water heating, a spotty enthusiasm for gas refrigeration and an "imaginary" approach to gas house heating.

From a pricing standpoint the record bears out these contentions. No one will disagree that the initial part of gas rate structures have been too low for the cooking load. Of course, this involves political expediency and helps explain the struggle to hold on to the cooking load which is basic to the manufactured gas industry. It naturally follows from this under-priced service, delivered to consumers at a loss, that the initial part of the rate structure is the great obstacle to putting in a promotional rate for water heating and refrigeration so as to bring in a greater return on investment.

In house heating, the last straw hope of the gas business, we have an amazing paradox. The natural gas companies, before the war, steadily added gas heating customers because their rate structures for house heating were *competitive* with other fuels. At the same time, the manufactured gas companies were spending money to promote house heating at a *premium* over other fuels. The sales volume of the natural gas companies continued to increase during the war, the only obstacles being shortage of gas heating units. On the other hand, the manufactured gas companies with declining earnings began to be besieged because they suddenly found themselves with uneconomic rate structures overwhelmingly attractive to the consumers but inevitably back-breaking to the companies with inadequate facilities.

Natural gas companies' earnings began to improve, but their sister manufactured gas companies did not fare so well.

The post-war period found the natural gas company not shy of earnings but shy of service: namely, not enough gas and too few facilities. The manufactured gas company, with thousands of applicants, pinched as to earnings because of rising costs and inadequate rates, found itself with a serious problem. Strong measures had to be taken (substantial rate increases and a refusal to do business with the applicant) but the customer, because of the recent coal debacle, still wants gas heating regardless of price.

This is a rather sketchy resume of where we have been and what has generally been done, or should I say, not done. And resorting to the easy task of thinking hindsight-wise, I will now suggest what might have been done.

No one can deny that the straight natural gas companies have fared well regardless, but let us look at the wide disparity between the public responsibility aspects of the pipe line company and that of the distributing company. Those who produce and transport natural gas must deal in large volumes to make their projects pay. Natural gas in the ground is, so to speak, not on the balance sheet. It is, as such, a mineral and only takes on value when delivered to the ultimate consumer. Therefore, it is only realistic that natural gas producers want new markets so that they can make their acreage produce income.

The transporting companies depend on transporting large volumes. You will find that the pipe lines are mortgaged so that they must be amortized over a period not greater than the estimated period of supply. At the end of or along the pipe line are the distributing utilities which have a public responsibility of continuous and reliable service. Many such gas companies are 100 years old. Contrast this age with the number of years which the natural gas reserves portend.

The use of depleted or near-depleted gas or oil fields located near the centers of consumption for the storage of off-

Presented at annual business conference, New England Gas Ass'n, Boston, March, 1950.

We Have No Quiz Program —But We Do Have Questions

The impending availability of natural gas at a price per therm lower than that of any manufactured gas brings to the minds of all concerned a number of questions:—

1. With no purchase of natural gas, can I, in my situation, operate my plants in such a way that the supply is more secure than it would be with natural gas as the only source? Can I, by so doing, make gas at a cost which will at least approximate the cost per therm of natural gas and avoid the high cost of burner adjustment?

2. Or, shall I arrange, with heavy cost of burner adjustment, to distribute straight natural gas at a relatively lower cost per therm? Or shall I purchase natural gas and use it in my plant as a low cost material of manufacture?

3. There will at the same time be another question—What about the recently developed processes for making gas? Will recourse to any of them be helpful, with or without natural gas?

By P. T. Dashiell, consultant, United Engineers & Constructors, at annual business conference, New England Gas Ass'n, Boston, March, 1950.

peak gas has become increasingly important.

All these factors point to the fact that the distribution utility should be morally bound to do its planning so as not to mortgage its future consumers. It must make its plans so that there is a reasonable consideration of the future.

Straight natural gas companies are selling a service, the value of which is greatly in excess of the rates being charged. In many areas the price of heating one's home with natural gas is about half of what it would be with other fuels. Therefore, the demand naturally is beyond all comprehension and has forced these companies to say "no more space-heating." In such cases, the result is that you have the community confused because they read of pipe lines being extended—they are lulled into believing there is no end to natural gas and they cannot understand the situation. Needless to say, where such restrictions are in effect, the local utility is not popular. But let us look at those natural gas companies where they go merrily on their way believing there can be no problem.

Two Kinds of Trouble

This latter group finds itself at times confronted with one or two major problems:

1. Lack of main capacity—It takes money to increase distribution facilities, and if not that problem, they have the other problem which harassed some of them this winter, namely:

2. Continuous service to customers —(Having put on a tremendous number of house heating customers the pipe line supplier somewhat blithely says "It's cold today—we can't keep the pressures up—please curtail or restrict service.")

Between these possibilities one ponders whether it was wise and in the customer's interest to have shut down so many manufactured gas plants. Might it not have been better to have brought natural gas in as the enriching agent, keeping its value commensurate with its ultimate scarcity and competitive costs. This would have brought relief, it would have lowered costs, it would have made possible maintaining rate levels and meant some reductions, and also would have prevented some of the rate increases. The use of natural gas as a base and supplementary load would have made the production and transportation of natural gas more orderly; it would have kept it within sound economic bounds and would have benefited more of the nation's population.

You are troubled by inadequate earnings, possible write-offs, electric and bottled-gas competition and natural gas looks like the answer. And, with some qualifications, I think it is the answer, if viewed in a realistic light and evaluated so as to make the most of the circumstances and conditions.

Here, I would like to give you the benefit of some personal experiences, and other actual cases. In my company's case we have changed certain areas back and forth, back and forth and back and forth—yes, three times. We have seen natural gas run out; we have seen it wasted under boilers; we have seen it under-priced. Right at this moment, the companies in up-state New York (including my own in one district) have their house heating sales restricted because of, among other reasons, the natural gas supply limitations.

Three weeks ago, at the height of the coal strike, we tried to save steam coal by under-firing a steam plant. We spent substantial sums making the conversion. Forty-eight hours later we were advised that due to the weather, pressures had fallen and Pittsburgh industrial gas customers were being curtailed 50 per cent, Ohio industrial customers 30 per cent, and elsewhere industrial plants were being shut down where straight natural gas was being served, and would we please get off the line.

A very large middle-west city has six times had its pipe line supply interrupted—one break lasting more than 72 hours—and that company today is spending 20 millions on its gas manufacturing plant. Its management looks into the future with confidence that gas service is here not for just today and tomorrow but for 100 years from now.

New England has pioneered in many sound utility practices and policies. The latest figures (1948) for New England gas utilities as a group show net earnings of 2.4 per cent on fixed capital less depreciation reserves. Competitively the average rate for water heating seems too high and as for house heating, present saturation of house heating is not overwhelming.

The Rate Crisis

What can be done? Right at the start I suggest complete scuttling of present rate structures. Soundly pricing gas service is in the interests of all. Now is the time to put rates in order.

Then there is the pressing need to express rates on a therm basis with, of course, appropriate thermal billing factors to cover applicable variations in the thermal content of natural gas. This is particularly true where properties may be scattered and complete conversion is in the offing in a year or more.

To retain cubic foot rates and include their therm equivalents will only add to the confusion rather than resolve it. There is no question that therm rates rather than volumetric rates should go hand-in-hand with conversion. This I cannot over-emphasize and you will do yourselves a great rate-wise service, if you have not already done so, to get on the job now and sell your respective commissioners that the therm should be the unit for pricing gas service, and why. The commission must be made to understand that such a matter is a joint company-commission responsibility and that the commission by accepting such changes makes possible in still another way their fulfillment of the company-customer relations which make for more complete and satisfactory service.

You can avoid a flood of service complaints and rate complaints, after having converted your territory, by having made really effective use of your home service department. Have your own contact people understand what is involved, and why, in the change-over to natural gas. The home service department, the meter readers, customer relations and service board and service counter people all must be fully posted on what the conversion agency is doing on the customers' premises.

Tell All to All

From a customer information and relations point of view, I guarantee that you will be amazed at the lack of understanding by your own people of the questions arising from the problems involved in making the conversion. Do not underestimate or belittle the knowledge of customers and their interest in the why and wherefore of what is being done to their appliances, and why. Do not send just one letter advising of the conversion event to come but rather spell it out in the newspapers and follow up with descriptive and explanatory broadsides. Include a sketch descriptive of the burner-orifice adjustments and even include a colorful picture of the gas flame, before and after. Such relatively minor precautions will materially avoid the bad after-conversion realization that customers and employees had not received as much information as they should have had to understand the conversion problems.

Of course, if a rate reduction is involved at the time of the conversion, sins of omission or commission customer-wise will be somewhat forgiven.

I recommend a central cleaning office to handle conversion complaints, and also to follow them up.

Make clear to contact people the matter of under-gassed and over-gassed burners, the cause of pilot outages, the why of poor top-burner ignition, the different character of the manufactured gas flame and the natural gas flame. The matter of street and house-pressures, particularly where regulators are

(Continued on page 47)

News of the Gas Industry

Conover Elected President Of Equitable Gas

A. W. Conover

A. W. Conover, President of North Shore Gas Co., Waukegan, Ill., has been elected President of Equitable Gas Co., with general offices at Pittsburgh.

The gas system under Mr. Conover's management is comprised of Equitable Gas which distributes natural gas in the Pittsburgh district, and two affiliates, Pittsburgh and West Virginia Gas Co. and Kentucky-West Virginia Gas Co. The former is a natural gas producing and transporting company operating in West Virginia, and the latter produces natural gas in Kentucky and holds large reserves in that state.

The gas companies in the three states are subsidiaries of the Philadelphia Co., which is the holding company for this group, and which must dispose of its holdings to comply with the requirements of the holding company act. The common stock of the gas companies will be sold to the public in the near future or will be distributed to the present stockholders of the holding company.

The selection of Mr. Conover as President of the gas companies is a step in preparation for independent ownership and operation of the gas companies, and will be followed later by the selection of a new board of directors.

Mr. Conover has been President and general manager of North Shore Gas Co. since the re-organization of the company in 1942. It was converted from manufactured gas to a natural gas operation in 1947.

Prior to his position with North Shore, he was vice-president and general manager in charge of operations of natural gas and electric companies in Oklahoma, Colorado, and Ohio.

Mr. Conover is a director of the Illinois State Chamber of Commerce, and he served as President of the Waukegan-North Chicago Chamber of Commerce in 1944 and 1945. He will continue as a member of the board of directors of North Shore Gas, and as a member of its executive committee.

Luce Is V-P, Comb'd Operations, Of Public Service of N. J.

Donald C. Luce has been elected vice-president in charge of combined operations and a director of Public Service Electric and Gas Co., Newark, N. J., according to an announcement by George H. Blake, President.

Mr. Luce succeeds the late Jacob T. Barron.

Wuestenfeld Succeeds Conover At North Shore Gas

Wm. J. Wuestenfeld has been elected President and general manager of the North Shore Gas Co., Waukegan, Ill., to succeed A. W. Conover on April 1, according to an announcement by C. J. Mulholland, secretary-treasurer of the company.

Mr. Conover resigned to accept the presidency of Equitable Gas Co. in Pittsburgh.

Mr. Wuestenfeld was vice-president of North Shore. Prior to moving to Waukegan four years ago, he served for many years in executive capacities with gas and electric utility companies in Davenport, Ottumwa, and Muscatine, Iowa. He is an engineering graduate of Purdue.

Mr. Wuestenfeld had charge of conversion of North Shore Gas to natural gas three years ago.

Shipments of Gas Ranges, Water Heaters Rise

Gas range shipments were 77 per cent higher and those of gas water heaters 63 per cent higher this January-February than they were for the same period a year ago, according to the Gas Appliance Manufacturers Association.

According to Edward Martin, director of marketing and statistics, GAMA: "Total shipments for the two-month period were 398,000 units for gas ranges. This compares with 224,400 in 1949, and 451,200 in 1948. The 1936 to 1940 average was 169,500. In January manufacturers delivered 185,000 gas ranges, and in February this total went up to 213,000.

"Shipments of gas water heaters were 282,000 units this year compared with 172,900 units in 1949. In January 1950, 128,000 units were shipped and in February, 154,000 units."

Top Executive Shifts Are Made By Baltimore Consolidated

Wm. Schmidt, Jr.

Charles P. Crane

John H. Wolfe

Charles P. Crane was elected President of Consolidated Gas Electric Light and Power Co. of Baltimore at a meeting of the board of directors on March 21.

Mr. Crane, formerly executive vice-president, succeeds as President William Schmidt, Jr., who was re-elected chairman of the board and chief executive officer of the company.

Mr. Schmidt has held both positions since 1946, but declined re-election as President in order to permit the advancement of other officers of the company.

Mr. Crane has been associated with the company since 1910, having received his early training in the public utility business under the immediate direction of the late Charles M. Cohn, who was then vice-president and later succeeded to the presidency and chairmanship.

Mr. Crane was elected vice-president in 1938, and in 1946 executive vice-president, a director of the company and a member of its executive committee. He is a director and past President of the Maryland Utilities Association.

The directors elected J. Theodore Wolfe executive vice-president. Mr. Wolfe has been with the company since his graduation from the Harvard Business School in 1932, and has been a vice-president since 1946.

The company also announced the re-election of Ralph L. Thomas and Her-

man L. Gruehn as vice-presidents, and Francis E. Rugemer as treasurer. Austin E. Penn, Abbott L. Penniman, Jr., and John H. Wolfe were elected vice-presidents, the latter succeeding Henry R. Cook, Jr., whose retirement was announced. Otis E. Smith was elected secretary, a position formerly held by Mr. Penn.

Koppers Elects New Chairman and Executive Vice-Pres.

General Brehon Somervell, President of Koppers Co. since 1946, was also named chairman of the board on Mar. 28.

J. P. Williams, Jr., who retired as chairman, will remain on the board.

W. F. Munnikhuysen, who has been vice-president and general manager of the company's wood preserving division, was made executive vice-president. He will be the company's second highest executive officer.

S. V. O'Lenic Made President Of Chattanooga Gas

S. V. O'Lenic, formerly President of the West Tennessee Gas Co., Jackson, Tenn., has been elected President of the Chattanooga Gas Co.

Ebasco Selects J. E. Lothian As Business Consultant

The appointment of John E. Lothian as a business consultant of Ebasco Services Inc., has been announced by T. C. Wescott, President.

Mr. Lothian previously was associated for two years with Industrial Commodity Corporation as an economist and associate director of research.

'Court of Flame' Trophies Won By Six Gas Companies

Six gas companies have been named as winners of the "Court of Flame" sales trophies for their effort in selling automatic gas water heaters in the recently completed year long sales campaign conducted by the Gas Appliance Manufacturers Association and 22 sponsoring gas water heater manufacturers, J. F. Donnelly, Chairman of the 1949 Sales Promotion Committee, Gas Water Heater Division, GAMA, has announced.

These awards were made on the basis of the greatest number of "Court of Flame" heaters sold for the year by their salesmen and dealers combined per thousand residential meters, as registered by them in the contest.

The winners are: The Brooklyn Union Gas Co.; Rochester Gas & Electric Corp.; The Hartford Gas Co.; Delaware Power & Light Co., Wilmington; East St. Louis Division, Illinois Power Co., East St. Louis, Ill., and Spring Valley Division, Rockland Gas Co., Inc., Spring Valley, N. Y.

According to Mr. Donnelly, "These awards stand for excellence in the field of selling."

Frank B. Wright

George S. Coates

Frank B. Wright Elected V-P Of Southern Counties

Frank B. Wright, who at present holds the position of manager of Southern Counties Gas Company's Ventura, Calif., division, was elected a vice-president of the company at a meeting of the board of directors on March 15. He will take office on May 1 upon the retirement of Norman R. McKee.

Mr. Wright will have charge of sales, public relations, and customer department functions. Since his employment by Southern Counties in 1922, he served in Pomona and Santa Monica before taking the post of division manager in 1945.

George S. Coates, division supervisor of the customers department in Santa Monica, has been appointed to the newly created post of manager of the customers department with headquarters in Los Angeles, effective May 15. Mr. Coates, who was first employed by the company in 1935, has served as credit manager, district chief clerk, and as supervisor of the customers department in both the eastern and Santa Monica Bay divisions.

The Ventura division manager's post will be assumed by Monte M. Temple, former superintendent of the company's eastern division. Thomas N. Banks was appointed to fill the post of division superintendent of eastern division vacated by Mr. Temple.

Ray W. Anderson will take over Mr. Coates' duties as supervisor of the customers department in the Santa Monica office.

William C. Bullock was promoted to division supervisor of the Customers Department in Ventura, and Gareld K. Shick will take over the duties of chief clerk of the Texas Pipeline division.

H. B. Hurley Leaves Continental To Join Republic Natural

H. B. Hurley, assistant regional general manager, Continental Oil Co., Fort Worth, has resigned to become vice-president of Republic Natural Gas Co., Dallas, according to an announcement by W. H. Wildes, President of Republic.

Mr. Hurley, who has spent more than 30 years in the oil and gas business, had been with Continental for 23 years.

Companies in and near Boston Sponsor New TV Show

Joining Boston Consolidated Gas Co. in sponsoring the first full-scale, live dramatic television show ever to be televised from a New England studio are: Cambridge Gas Light Co., Dedham & Hyde Park Gas Co., Milford Gas Light Co., Old Colony Gas Co., Plymouth Gas Light Co. and Worcester Gas Light Co. Appliances featured on the show will be Glenwood gas ranges, Ruud water heaters, Servel refrigerators and Hamilton gas clothes dryers.

The presentation—"That Young Couple"—is televised each Sunday afternoon at 4:30 for one-half hour at NBC's Boston station WBZ-TV. Featured in the production are the cast of the Brattle Theatre Co., a leading professional repertoire theatre.

"That Young Couple" is a specially-written new series of domestic comedies—the story of a young suburban New England couple, Susie and Ernest Young, and their trials and tribulations.

Scripts for the production are written by Ruppert Pray, Hollywood-New York writer, well-known in radio-television circles for his contributions to such productions as "Ozzie and Harriet," "Vic and Sade," and "The Goldbergs."

Scenes for the play are laid in the Young's home where there is an all-gas kitchen set with action carried over to the sales floor of the local gas company, thus affording a vehicle for the display of modern gas appliances and for injection of the gas story into the play's dialogue.

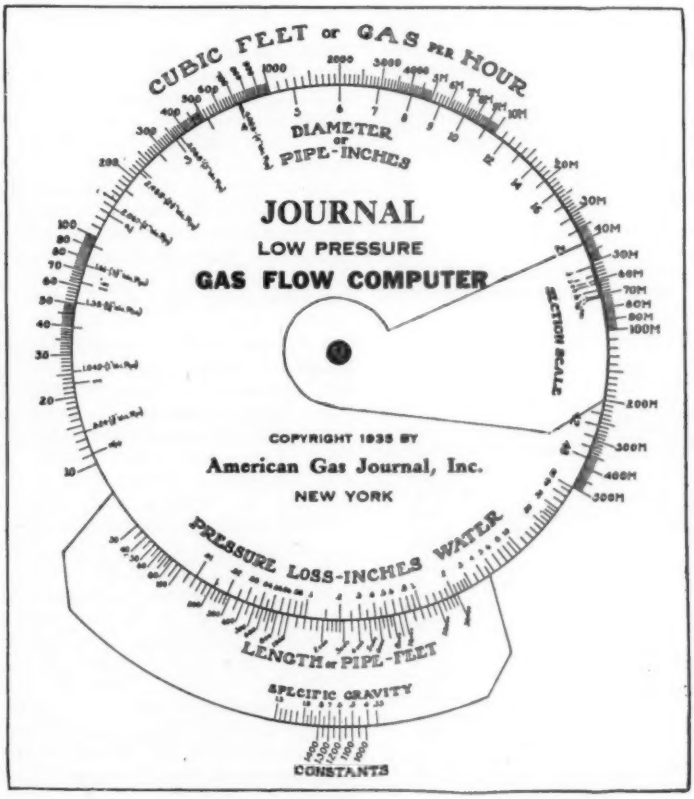
A staff of 50 people are required to put this show into televiewers homes. It is believed by those sponsoring the show that it will provide interesting and wholesome entertainment for the entire family and furnish a vehicle for showing modern gas appliances in modern settings and for telling the gas story to WBZ-TV's three-quarters of a million viewers.

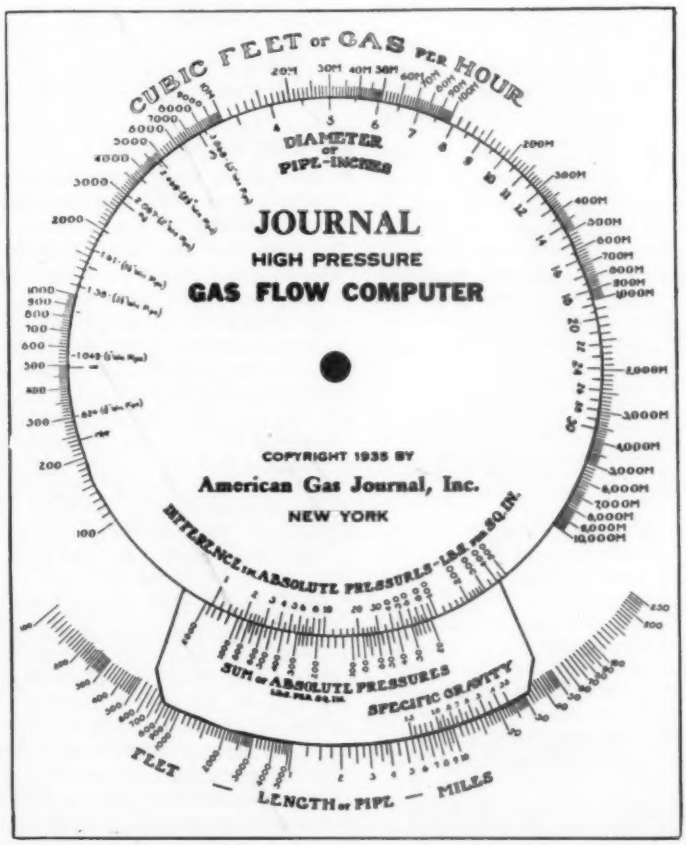
El Paso Natural Asks Hike In Wholesale Rates

El Paso Natural Gas Co. has applied to the Federal Power Commission for an increase in its rate applicable to wholesale service to Southern California Gas Co. and Southern Counties Gas Co., of California, which would amount to approximately $2,465,000 annually, or 12 per cent based on anticipated sales for the 12 month period ending April 30, 1951.

This is one of the largest rate increases ever proposed to the commission by a gas utility company.

El Paso Natural said that the proposed increase is needed to obtain a reasonable return on deliveries to Southern California and Southern Counties. Paul Kayser, President of the company, said that increases in the cost of purchased gas, wage increases and increases in cost of pipe line materials are the reasons for this rate increase proposal.





JOURNAL

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Consolidated Edison Terminates Cooperative Dealer Plan

Consolidated Edison Co. of New York, has announced that it intends to terminate, effective June 30, its cooperating dealer appliance plan, through which the company has helped dealers promote the use and sale of gas and electric appliances.

The announcement was made in a letter sent on March 17 by E. F. Jeffe, vice-president in charge of sales, to each of the 1,000 appliance dealers who have been taking part in the plan.

The letter said, in part: "It has been the policy of the Consolidated Edison Co. under the cooperating dealer appliance plan, the written text of which is dated April 1, 1946, but which has actually been in effect since 1935, to discontinue activities in connection with the direct merchandising of electric and gas appliances as soon as manufacturers, distributors and cooperating appliance dealers could, in the opinion of the company, carry on such activities in the best interests of our customers. Progressively from time to time various changes have been made in the cooperating dealer appliance plan to effect this policy.

"It is the opinion of management of the Consolidated Edison Co. that appliance dealers can now render required services to customers and also that customers have gained an assurance and confidence in dealing with these appliance dealers. There is a general customer acceptance of standard brand electric and gas appliances. It is at this time the opinion of management of this company that the cooperating dealer appliance plan may now be abandoned and accordingly, the plan will be terminated effective as of June 30, 1950. This termination will be effected through a formal notice to be issued at a later date."

Mr. Jeffe in his letter also revealed that Consolidated Edison intends to maintain appliance centers where manufacturers may display standard brand appliances and which would be available to supply information to both dealers and customers. Temporarily, these appliance centers will be established at the company's 20 chief district offices in Manhattan, the Bronx, Brooklyn and Queens.

The company's appliance promotion bureau is to be replaced by a home utilization bureau. This bureau, as well as the sales engineering bureau, will be available to appliance dealers for assistance in the promotion of the use and sale of electric and gas appliances.

Peoples Natural Stops Appliance Sale for Dealer Program

At March dinner meetings held for dealers in Western Pennsylvania areas served by The Peoples Natural Gas Co., Christy Payne, Jr., vice-president of the company, announced that, effective March 1, the company was removing itself as a competitor of the dealer in the sale of gas appliances.

He pointed out that future sales policy, in areas served by Peoples Gas, would be to offer local dealer organizations every possible assistance in the promotion and sale of their own gas appliances.

Highlights of the new dealer program revealed were:

1. That Peoples Gas, after March 1, would not sell gas appliances in competition with dealer organizations.

2. That the company will support and promote all approved lines of gas appliances handled by dealers, avoiding special company endorsement of any make or line.

3. That the company will provide full support to all manufacturers of approved gas appliances, and will display all makes of qualified gas appliances, with a fair division of time and space.

4. That Peoples will make available to dealers all of the promotional and sales programs produced by the company and by the American Gas Association.

East Tenn. Natural Plans Extension to Bristol

East Tennessee Natural Gas Co., of Chattanooga, has filed an application with the Federal Power Commission proposing to increase the delivery capacity of its pipe line system by 40,000 Mcf of natural gas per day through the construction of approximately 139 miles of pipe line extending from a point south of Knoxville to Bristol, Tenn.

The proposed facilities, estimated to cost $5,264,120, would provide natural gas service to the markets and areas extending from Oak Ridge to Bristol.

East Tennessee expects to obtain its required additional gas supply from Tennessee Gas Transmission Co.

More Underground Storage Wanted for Buffalo

Iroquois Gas Corp., Buffalo, N. Y., has applied to the Federal Power Commission for authorization to develop three new underground natural gas storage fields, to enlarge an existing field, and to construct approximately 23 miles of pipe line, all in western New York state.

Two of the underground storage pools which the company plans to develop are located in Erie County, one near Wales and Holland, and the other in the Evans area. The third new field is in the vicinity of Bennington in Wyoming County. The existing field which the company proposes to enlarge is the Collins Storage Field, at Collins, in Erie County.

New England Meeting

(Continued from page 30)

Faulstich, asst. gen. mgr., Springfield Gas Lt. Co.; Jesse L. Johnson, vice-pres., Providence Gas Co.; Ronald A. Malony, exec. vice-pres., The Bridgeport Gas Light Co.; S. C. McLaughlin, vice-pres. & mgr., Claremont (N. H.) Gas Lt. Co.; H. Coleman Moore, Jr., treas., NEGEA Service Corp., Cambridge; Herbert A. Murphy, vice-pres., Stone & Webster Service Corp., Boston; Charles R. Prichard, Jr., vice-pres., treas., & gen. mgr., Gas Service, Inc., Nashua; John J. Quinn, vice-pres., Boston Consolidated Gas Co.; Charles E. Rainsbury, sales rep., Eastern Appliance Co., Boston; William Webster, vice-pres., New England Elec. System, Boston; John West, Pres., Worcester County Elec. Co.; Alexander McW. Wolfe, mgr., American Meter Co., Inc., Boston; R. B. Wright, dist. sales mgr., Hardwick Stove Co., Inc., Boston; Roy E. Wright, dir. of gas sales, NEGEA Service Corp., Cambridge.

Ex Officio Directors: Immediate Past Presidents—Earl H. Eacker, Pres., Boston Consolidated Gas Co.; Edward G. Twohey, vice-pres., Worcester County Elec. Co.; *Division Chairmen: Accounting*—Albert E. Donehey, supt. of gen. acctg., Boston Consolidated Gas Co.; *Industrial*—Ford R. Waugh, sales rep., Eclipse Fuel Engineering Co., West Medford; *Manufacturers*—William F. Marsh, sales rep., Lucoflex Plastic Fabricating Co., Boston; *Operating*—Edward F. Kennedy, asst. mgr., Malden & Melrose Gas Lt. Co.; *Sales*—Norman R. Millard, supt., prom. div., sales dept., Boston Consolidated Gas Co.

Home Service Luncheon

Attendants at the Annual Business Conference of NEGA were invited to attend the Home Service luncheon, under the auspices of the Sales Division of the Association, held Friday noon with Ella A. Heyne, Northampton Gas Light Co., and chairman NEGA Home Service Group, presiding. Irene Muntz, Rochester Gas and Electric Cpn., and Chairman of the Home Service Committee of AGA, was the featured speaker on "Keeping Up with the Homemaker."

Margot J. Whitmire, Springfield Gas Light Co., presented the report of the nominating committee of which she was chairman. The following officers were unanimously elected for the year 1950-1951.

Chairman: Ella A. Heyne, home service director, Northampton Gas Light Co.; *vice-chairman:* H. Dorothy Keller, home service director, Blackstone Valley Gas & Electric Co., Woonsocket; *Secretary-Treasurer:* (Mrs.) Gertrude M. Crosthwait, home service director, The Connecticut Light & Power Co., Waterbury; *Members:* Jeanne F. O'Brien, home service director, Lowell Gas Co.; Marie K. O'Brien, home service representative, Providence Gas Co.

Large GE Synchronous Motor Installed in Oregon

The largest synchronous motor in horsepower rating ever to be applied to drive a reciprocating compressor was installed recently in the Portland (Oregon) Gas and Coke Co. plant.

Driving a Clark six-cylinder compressor, the General Electric motor is rated at 4500 hp, 300 rpm, 11,000 volts. According to engineers, the compressor will handle up to 2,160 Mcf per hour of manufactured gas at 40 psi for more than 100,000 consumers in an 80-mile radius.

For peak winter loads, full output will be required, they said. For off-peak loads, however, cylinders or half cylinders may be bypassed, giving a variable through-put from a constant-speed drive.

Common Stocks

(Continued from page 32)

added, "our reserve funds had been built up in previous years when they were able to absorb these heavy deficits, but it is important to restore them to their former strong condition as rapidly as possible."

Analysis of the portfolios of a number of the country's major colleges discloses the swing from interest-bearing securities into common stocks in a search for higher income return.

Colleges accounting for nearly one-third of the approximately $1,750 million total of endowment funds of all colleges in the country had 41.95 per cent of their endowment funds in common stocks at June 30, 1949. This is a gain of more than 20 per cent from the 34.3 per cent so invested four years earlier.

Nearly Half

Of all the college portfolios studied, only one showed less than 30 per cent of its endowment funds invested in common stocks. In an increasing number of situations common stocks now account for between 45 per cent and 50 per cent of the total investments.

Need for replacing bonds with equities to obtain greater income is shown in the fact that first grade bonds now yield only 2.58 per cent, second grades 2.60 per cent, third grades 2.71 per cent, and fourth grades 2.93 per cent, compared with 2.77 per cent, 2.84 per cent, 2.94 per cent and 3.23 per cent respectively, provided on these issues at the end of June 1948.

Even with the benefit of the greater income from increasing proportion of common stocks in their portfolios, it is significant that investment income in the majority of the colleges now is in the neighborhood of only around four per cent to four and one-half per cent, the gain in investment income being far exceeded in most cases by increase in costs of all types. Dependence of endowment fund managers on common stocks presumably will become greater as the institutions are squeezed even further between rising costs on the one hand and falling income from senior securities on the other.

Further evidencing the press of funds for investment, principally from institutional sources, is the yield on better grade preferred stocks now, down to around 3.80 per cent, with no assurance that any appreciable increase in return soon will take place.

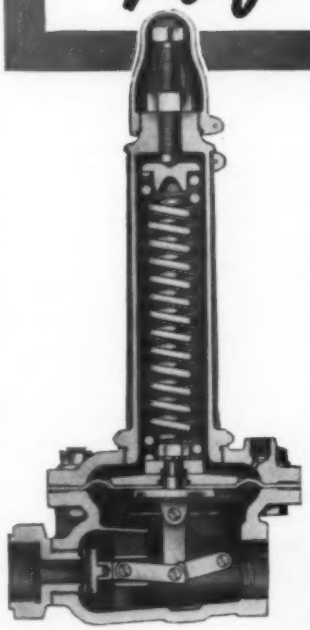
This will allow endowment fund managers no recourse but to place greater emphasis on common stock investments. In such a program stocks of gas companies presumably will occupy an important position as indicated in the case of Harvard University whose portfolio was commented on in detail in AMERICAN GAS JOURNAL, December 1949.

Affording fairly liberal income return despite their increasing popularity during recent years, the utility equities fit more closely than do most industrial shares into the fund managers' function of avoiding undue speculative risk and of stressing prudent management of the funds entrusted to their care.

IN THE HIGH PRESSURE FIELD

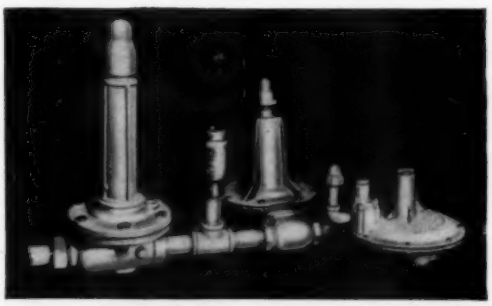
THERE IS SAFETY

IN *Reynolds* ...



Accurate, Safe Control

of tremendous pressures is an ever present problem in the gas field. Reynolds field Regulator illustrated at left is one of the many high pressure regulators built by Reynolds. It is thoroughly tested and proved in service. It handles up to 1,000 pounds safely reducing same to pounds. For more than fifty-five years Reynolds has designed and built gas regulators. Safety, accurate performance, years of service—these are some of the built-in factors responsible for Reynolds enviable position in the Gas Control Field.



Reynolds Gas Regulator Co.

ANDERSON, INDIANA, U. S. A.

GAS CONTROL SINCE 1892

Standards and Methods of Quality Control

(Continued from page 16)

Where the average total heating value of gas delivered to any customer in any month is more or less than 1000 Btu per cu. ft., the total charge for gas delivered during such month is increased, or decreased, respectively, in the percentage by which the average total heating value of such gas is greater or less than 1000 Btu per cu. ft. For example, if average heating value of gas delivered to a customer for a month is 1030 Btu a multiplier of $\frac{1030}{1000}$ or 1.030 is used and if the average Btu is 970, a multiplier of $\frac{970}{1000}$ or .970 is used.

The contracts require the heating value measurements to be based on a cubic foot of gas at 60° F., saturated with water vapor and under an absolute pressure of 30" of mercury at 32° F. This basis of Btu measurement is contrasted to the actual condition of the gas as delivered to customers where the dew point is appreciably lower than minus 50° F. at the sales pressure base of 15.025 psia for volumetric measurements.

In commercial natural gas measurement, 30" of mercury pressure is generally assumed to be equivalent to 14.73 psia. The difference between the heating value of a cubic foot of gas under a pressure of 14.73 psia when saturated and when dry is 1.77 per cent since $\frac{14.73}{14.73 - .2561} = 1.0177$. The difference between the heating value of a cubic foot of dry gas under a pressure of 14.73 psia and a pressure of 15.025 psia is 2.0 per cent since $\frac{15.025}{14.73} = 1.020$. The total difference between the Btu arrived at by heating value measurements based upon the 60°, 14.73 psia saturated basis as arbitrarily set up by contract and the "actual" Btu per cu. ft. of the dry natural gas under the pressure base of 15.025 psia specified in the same contract for volumetric measurements, is 3.81 per cent, since $\frac{15.025}{14.73 - .2561} = 1.0381$. This is a difference of approximately 38 Btu per cu. ft.

Location of Recording Calorimeters

(1) A recording calorimeter is in service for field quality check purposes, at Little Rock, Ark., pump station 5, to record the heating value of the Little Inch and Big Inch streams alternately before they are combined by mixing in the common headers of compressor stations further up the line.

(2) A recording calorimeter is installed at Lisbon, La., for use in connection with the Texas Gas sales measuring station and for field check purposes. Gas samples are taken from these stations monthly for heating value determination. The sales area for the pipe lines is divided into Zones 1 and 2, covered by FPC gas tariff rate schedules DCQ-1 and DCQ-2, respectively. Zone 1 covers Missouri, Illinois, Indiana, Ohio and western Pennsylvania, west of pump station 22, near Rockwood, Pa. Zone 2 covers eastern Pennsylvania, New Jersey and the New York City area. To record the applicable heating value throughout these two zones requires the use of three recording calorimeters:

(3) Suction of Station 16 (Lebanon, Ohio), to take care of all gas sales west of there in Zone 1;

(4) Station 18, Somerset, Ohio, or Station 20, Wind Ridge, Pa., applicable for those sales in Zone 1 situated between Stations 16 and 22,

(5) Station 25, Eagle, Pa., for all sales in Zone 2.

To maintain the accuracy of the recording calorimeters, air temperature in the calorimeter rooms is controlled by insulating buildings, thermostatically controlled heat and air conditioning. The calorimeter consists of two separate units; a tank unit or calorimeter proper where the heating value of gas is measured, and a recorder unit which contains the instruments necessary for translating the heat measurements into Btu and recording them graphically. The heating value of the test gas is determined by imparting all the heat obtained from the combustion of the test gas to a stream of air and measuring the rise in temperature of the air. The streams of test gas and heat absorbing air are maintained in fixed proportion to each other by motor driven metering devices which are geared together. Consequently, the temperature rise produced in the heat absorbing air is directly proportional to the heating value of the test gas without regard to the actual rate of gas burning. This temperature rise is translated into Btu per standard cu. ft. and recorded graphically.

Specific Gravity

For use in measuring the gas with orifice type meters, gas purchase and sales contracts provide for specific gravity determinations. These contracts stipulate that the specific gravity of the gas delivered shall be determined by the continuous use of a standard recording gravitometer, agreed upon by the parties, so installed that it may properly record the specific gravity of the gas flowing through the meters. The arithmetic average of the specific gravity recorded each 24-hour day is used in computing volumes for that day. Some of the gas purchase contracts permit determination of specific gravity by spot tests, if the parties agree. However, this method is not practical where the gas goes through a gasoline or chemical, due to the possibility of appreciable fluctuations in its specific gravity.

Instruments Used

Two types of instruments for gravity determination are in use by Texas Eastern, the gravity balance and the recording gravitometer. The gravity balance is a portable instrument which compares the density of gas directly to the density of the air by testing both the gas and the air. The density of gas is proportional to its pressure, and the buoyant force exerted upon a body suspended in a gas is proportional to the density of the gas and therefore to its pressure. If the buoyant force exerted upon a body is made the same when suspended successively in two gases, then the densities of the two gases at normal pressure are in inverse ratio to the pressures. This ratio of densities, by definition, is the specific gravity of the gas. The specific gravity of gas is defined as the ratio of the density of the gas, under certain conditions of pressure and temperature compared to the density of air at the same conditions of pressure and temperature, the air being dry and free of carbon dioxide.

The gravitometer, which we generally use, is a stationary instrument, consisting essentially of a balance which weighs the difference between the weight of a certain volume of air and the weight of the same volume of gas under the same conditions. The gas is contained within a float which is suspended from the balance bar by stainless steel knife edges and hook bearings. In order to give power to the instrument, a large float approximately one cu. ft. volume is used to receive the gas. The gas sample is weighed in the atmosphere of air by a balancing mechanism, and a continuous record of the weight is recorded on the chart. The weight of the metal in the float is counterbalanced by the balancing weight; therefore, the force which moves the balance bar and consequently the pen arm is derived from the difference in the weight of the gas in the float

(Continued on page 42)

CONVENTION CALENDAR

April

20-22 *Florida-Georgia Gas Association,* Business Conference, Biltmore Hotel, Palm Beach, Fla.

28-29 *Indiana Gas Association,* French Lick Springs Hotel, French Lick, Ind.

May

1-4 *Chamber of Commerce Annual Meeting,* Wash., D. C.

3 *Missouri Association of Public Utilities,* Joplin, Mo. (Meeting of member company executives)

4-5 *Oklahoma Utilities Association,* annual meeting, Biltmore Hotel, Oklahoma City, Okla.

8-9 *A.G.A. Natural Gas Department,* Spring Meeting, Mayo Hotel, Tulsa, Okla.

8-11 *Liquefied Petroleum Gas Association,* annual convention, Palmer House, Chicago, Ill.

11-12 *Public Utilities Advertising Association,* annual convention, Kansas City, Mo.

16-18 *Pennsylvania Gas Association,* Galen Hall, Wernersville, Pa.

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(Continued from page 40)

and the buoyancy of the air displaced by the float.

Gasoline Content

Gas purchase contracts stipulate that the gas purchased shall not have greater than two-tenths (0.2) gallons per Mcf of natural gasoline, as determined by the NGAA standard charcoal test. This provision is included to eliminate the nuisance involved in the condensation of heavy hydrocarbons in the transmission line. Since hydrocarbons are worth more as gasoline than as natural gas, most suppliers extract as many of the hydrocarbons as possible before selling the gas.

The standard charcoal test involves the passing of a measured volume of sample gas through a bed of charcoal. Certain of the heavy hydrocarbons are absorbed on the charcoal. These hydrocarbons are released when the charcoal is heated and distilled in a flask containing glycerine. These heated vapors are condensed with an ice bath and the condensate measured. The measured condensate and the measured gas volume can be calculated to gallons per Mcf (qp Mcf) basis by the use of the proper conversion factor.

A comparison of the gas analysis from one of our purchase stations before and after the installation of the gasoline plant is as follows:

Component	BEFORE Mol. %	BEFORE GPM	AFTER Mol. %	AFTER GPM
Carbon Dioxide	2.60		2.70	
Nitrogen	NIL		NIL	
Methane	85.31		92.11	
Ethane	7.17		4.88	
Propane	2.94	0.807	0.29	0.080
Iso-Butane	0.45	0.147	0.02	0.007
N-Butane	0.76	0.239		
Iso-Pentane	0.23	0.084		
N-Pentane	0.15	0.054		
Hexanes	0.25	0.103		
Heptanes Plus	0.14	0.064		
	100.00	1.498	100.00	0.087

In a gasoline plant, the raw gas is sent to a bubble-tray absorber, where the heavy components are absorbed in oil. The gas which is not absorbed leaves the top of the tower, and, after dehydration goes to the pipe lines. The rich oil stream containing the absorbed hydrocarbons, after heating, goes from the bottom of the tower to a still where the absorbed portion is separated from the absorber oil. The lean absorber oil is removed from the bottom of the still and, after cooling, is recycled back to the absorber. The absorbed portion of the original raw gas or overhead vapor from the still is then processed, dependent upon the design of the individual plant, to make such products as propane, normal and iso-butane, gasoline, kerosene and fuel oil. Some of the more modern plants, which incorporate refrigeration of the inlet gas, and oil streams to the absorber, are designed for as much as 80 per cent propane recovery in the absorber.

One of our suppliers reports the following daily yields from 50,000 Mcf feed to the gasoline plant:

Products	Gals. per Day
Propane, 95% pure	8,500
Butanes, 95% pure	12,650
Gasoline, 9-lb. R.V.P.	42,100
Kerosene	7,600
Distillate fuel oil	1,950
Residual fuel oil	500
Total	73,300
Residue gas, Mcf	46,500

Water Content

One of the most important qualities which has to be controlled is that of water content. If a modern high pressure pipe line system is to operate successfully in the winter and overcome the hydrate menace, a dry gas must be purchased. Our gas purchase contracts require that the gas be dehydrated so that the water content never exceeds seven pounds per Mcf measured at 14.7 psia and 60° f., as determined by a dew point apparatus approved by the Bureau of Mines. Seven pounds per Mcf is the amount of water contained in the gas when it is saturated with water vapor at 800 psia and approximately 28° f. This is to prevent the condensation of any water in the gas at extreme pressure and temperature conditions. The gas from each of our gas purchase stations is subjected to a water content determination by the "dew-point" method at least once each week. Neglecting any deviation from the perfect gas laws, the relation between the dew point of a gas and the water content is as follows:

$$W = \frac{pw}{p} \times \frac{18 \times 10^6}{379}$$

where

W = pounds water per Mcf gas

pw = vapor pressure of water at observed dew point temperature

p = pressure at which dew point was determined, psia

18 = molecular weight of water

379 = pound — mole volume at 14.7 psia and 60° f.

For the actual case, the deviations from the perfect gas laws, such as the supercompressibility factor, would also have to be incorporated in the formula.

In general one of two methods is used in spot testing for water content.

(1) Bureau of Mines' dew point machine

(2) Laboratory means

The most frequently used means of determining the water vapor content of natural gas is the dew point method. The most versatile apparatus for determining the dewpoint of natural gas under pressure is the Bureau of Mines dew point tester. Its operation involves:

1—Cooling of a polished mirror surface in contact with the flowing gas under pressure, to that temperature at which condensation begins;

2—Direct visual observation of this condensate in the form of dew or frost on the mirror surface; and

3—Observation of the temperature at which the deposit appears and disappears, as indicated by a thermometer.

The instrument consists of a metal chamber into and out of which the test gas is permitted to flow. Gas entering the apparatus is deflected against the cooled mirror surface. The temperature of the mirror is indicated by a mercury-in-glass thermometer, whose bulb fits snugly into a thermometer well in the back of the mirror surface. When condensation of the water is observed, the temperature of the thermometer is noted. Knowing the pressure in the chamber, and with the use of suitable curves, the water content in pounds per Mcf may be determined.

Two laboratory means of determining the water content are:

The gravimetric method
Chemical reaction method

In the gravimetric method a measured quantity of gas is passed through weighed absorbers filled with highly hygroscopic material. After passage of the gas, the absorbers are re-weighed, and the increase in weight is taken as the weight of water contained in the known volume of gas. Dividing the increase in weight by the volume passed yields the weight per volume ratio.

The up-and-coming method of determining the water content is the Karl-Fischer chemical reaction method. In this method, the gas is passed through a Karl-Fischer reagent. By noting the volume of gas passed at the time of color change of the known volume of reagent, the water content may be calculated. The latter method has the advantage of being accurate regardless of the presence of heavy hydrocarbons, which limits somewhat the accuracy of the gravimetric method.

Various types of dehydrators are used by gas suppliers. Where the volume to be dehydrated is 10 to 35 MMcf per day, the most popular unit is the portable automatic solid desiccant dehydration unit. Fourteen models are available, all skid mounted, designed for working pressures up to 2000 psia and capacities up to 35 MMcf per day. Operation of the unit is as follows: The inlet stream is first put through a standard horizontal separator to remove all free liquids and any scale or solids. Two drying towers are used in the unit and these towers work on cycles; while one tower is dehydrating cold gas, the alternate tower is being regenerated by

heated gas. The regeneration gas is taken off ahead of the main inlet control valve, which admits the feed gas to the inlet gas automatic manifold, travels through a condensing type heater, picks up its heat and travels back to the regenerative gas inlet automatic manifold. The regeneration gas is then diverted to circulate through the tower that has become saturated with water vapor. In the meantime, the main gas stream is being diverted by the inlet gas automatic manifold into the other drying tower and the gas therein is becoming dehydrated and passes out of the bottom of the tower and thence into a gas cooler.

In the gas cooler, the dry outlet gas stream exchanges heat with the hot, wet regenerative gas stream, cooling the regenerative gas stream and condensing practically all of the water that has been taken out of the tower being regenerated. In order to provide a place to receive this free water, a water separator is provided to scrub the water from the regeneration gas before the regeneration gas is returned again to the main gas stream downstream from the main control valve, from which point the regeneration gas travels through the drying tower. The drying and regenerative cycles are automatic, the switching of the cycle being almost instantaneous and controlled by pilot operated diaphragm valves that are regulated by a time cycle controller.

Gas purchase and sales contracts contain typical clauses concerning sulphur and hydrogen sulphide: "The gas delivered hereunder (1) shall contain less than a trace of hydrogen sulphide per 100 cu. ft. of gas volume when tested in accordance with the following procedure." A strip of white filter paper previously moistened with fresh five per cent lead acetate solution shall be exposed to the gas for one and one-half minutes in a previously purged apparatus through which the test gas is flowing at a rate of approximately five cu. ft. per hour; the gas jet shall not directly impinge upon the test strip during the test. At the end of the stated time the test paper thus exposed shall be compared with a second test strip similarly prepared but not exposed to the test gas. If the exposed strip is not noticeably darker than the comparison strip, the gas under test shall be considered acceptable. If the exposed strip is noticeably darker than the comparison strip, the gas shall be tested quantitatively for hydrogen sulphide by the Tutweiler method; (2) shall not contain more than 20 grains of total sulphur per 100 cu. ft. of gas volume as determined by the Referee's apparatus, and mercaptan sulphur shall not constitute any portion of the allowable total sulphur content.

Once a month the gas from each of the gas purchase stations is subjected to a hydrogen sulphide test. At times, there have been intermittent traces of hydrogen sulphide reported from three or four of the purchase stations. But the quantity has been so minute, and the dilution effect so great when placed in the pipe line, that no trace of hydrogen sulphide has ever been reported on the tests conducted on the gas as it travels up the pipe line.

Odorization

Due to the fact that Texas Eastern lines traverse thickly populated areas in Zone 2, main line gas in that zone is odorized to facilitate the finding of leaks. We also individually odorize all gas used for domestic purposes in connection with the operation of our own company. For main line odorization we use a mercaptan type odorant since it is concentrated and has a relatively good carrying power while still maintaining a true gas-like odor. This odorant is composed approximately of 85 per cent mercaptans, 10 per cent booster (alkyl disulfides) and five per cent patented inhibitor. To improve the carrying power, it has a Reid vapor pressure of 4.2 and a specific gravity of 0.825-0.840. The rate of odorization is about one pound per million cu. ft. The cost of this type odorant is $.50 per pound, more or less.

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Venezuela Pipe Line

(Continued from page 15)

ing contrasts between the old world and the new. Sections of narrow streets and sidewalks with houses set in tight rows are offset by new developments where wide avenues prevail, and modern houses are set on individual lots. Caracas, the capital and largest city with a population of 378,000 leads the way in modernization. Whole blocks of small crowded houses are being demolished by government edict, to be replaced by wide streets and modernistic, functional, multiple dwelling housing units, financed by the government. In addition many new suburban housing sections are being developed by private financing.

The Venezuelan Atlantic Transmission Corp. held its first board meeting January 9, 1950. The following officers were elected:

President—Robert H. Colley, who is also President of Atlantic Refining Co.

Vice-president—J. Murray Williams, who is also President of Venezuelan Atlantic Refining Co.

Vice-president—E. Holley Poe, natural gas consultant.

Secretary—Richard Rollins.

Treasurer—N. S. McCausland.

Psychology Is Tool

(Continued from page 29)

men who will broaden out instead of flatten out when placed under greater responsibility. At the same time, the mistakes of promoting a man over his head can be reduced by determining in advance whether a star salesman has the executive potential of a sales manager, or whether the highly specialized accountant can develop the breadth of thinking needed for the controller's job.

When the modern administrator uses the tools of contemporary clinical psychology, an increasing variety of effective ways for developing the available potential becomes readily available. As the younger men understand and accept their own assets and their own liabilities, it becomes easier for management to coach a winning team. As each man gains greater self-understanding, it becomes easier for other men to work with him. He understands for himself the impact he makes on other people and takes appropriate action.

By and through, dealing with insights, understandings and appreciations of the personal resources of key men, a long-range management development program can be outlined which includes not only the acquisition of know-how but also the development of greater team work. For instance, a desk thumping junior executive began to see for himself that he was basically afraid of other people. When he understood that his reliance upon a fast offense as the best defense was like the small boy whistling through the graveyard, he began to take things easier. As his manner and attitude changed, he became promotional material.

Another junior executive was able to get on the team when the psychologist gave him the tools to analyze himself. He discovered that his constant pushing for a bigger office, a longer title and an additional secretary sprang from having a high school boy's desire to show off. A highly analytical engineer who had the personality of a porcupine learned the necessary to give-and-take for a supervisory job when he discovered for himself that his mind was too fast for most other people. He further found that it was a real challenge to his superior intellect to aid other people to think faster by asking them adroit, leading questions instead of making them feel inferior by flat contradictions and constant interruptions.

One of the acid tests of whether a key man is a good enough organizer to be promoted to a more responsible, execu-

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Can be supplied for use with any pressures. Easily lubricated through grease fitting. Indicator shows position of disc. Can be counter balanced for vertical jobs. Dash pot can be installed to prevent chattering when passing high velocity gas or air.

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tive position is what happens to his work when he is called away unexpectedly for two weeks. Does the job fall apart or do other people move in to take over in his absence? Every organization has its quota of men who regard themselves as indispensable. Organization charts, standard practice manuals and job descriptions have little effect upon them. Only when such men deepen their insights into themselves and see for themselves that they lack a basic sense of wit and humor in taking themselves so seriously is there any chance of getting them to delegate authority commensurate with responsibility to their subordinates.

The past war demonstrated to many companies that they had more able men in their ranks than they had supposed. When the pressure went on and comparatively inexperienced men were compelled to assume larger responsibilities, most of them stepped up to the opportunity. When psychological evaluations of younger men in the organization are made which can be laid along side their records of performance and training records, top management is then in the position to make very strategic deployment of the available manpower.

The Shape of Things to Come

The pattern of competition within the fuel industry is undergoing rapid and complex changes. It is becoming more and more difficult to base a profitable operation upon exclusive franchises, exclusive territories or exclusive processes. The management of a competitive enterprise has one remaining exclusive available, namely, an organization which is a team which runs faster and hits harder than the opposition. In business as in sports, star teams win more victories than teams of stars.

Play Ball

Usually the abler a key man is the more likely he is to be a distinct and unique individual. No two strong men have just the same way of doing business, yet each is successful in his own way. To capture and capitalize upon the individual style of operation of strong men yet weld them into a team is the daily task of the administrator.

When the vice-president in charge of sales, the vice-president in charge of operations and the vice-president in charge of finance toss the ball to each other in the manner of "Tinker to Evers to Chance," all problems of top management become soluble. Keeping a sharp cutting edge on the whole organization is largely a matter of team play and team play is a human problem more than a technical problem. It is people, their habits, their attitudes, their ambitions and their disappointments which must be taken into account as top management deals with the problems of competition. How to offset the all electric kitchen, or how to get enough gas to meet the demands of the new domestic heating installations, or how to keep construction men in the pipe line operation cost minded when they know that the speed of construction has a high premium placed upon it or how to find the best ways of changing over the habits of consumers when a change-over from manufactured gas to natural gas is made are problems which are more human than technical in their nature.

When one of these questions is answered, then two or more equally pressing questions of leadership take their place. Perceptive administrators soon conclude that wrestling with problems of coordination is their daily work. Those administrators who have learned to enjoy living with such problems are those men who have built an organization which can roll with the punch.

The clinical psychologist works with the administrator in developing a greater variety of ways of welding the enthusiastic sales promoter, the hard-driving operation's man, the meticulous technician and the precisionist paper shuffler into a hard hitting team which understands and appreciates each player's style of

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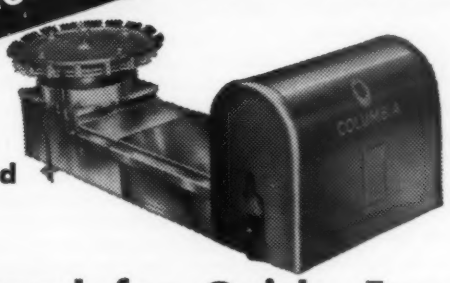

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New York Commission

(Continued from page 31)

year is one of the most vexing problems presented in this matter and, except to state the general principle, this question will be left for further consideration. As in the case of many other operating expenses, there well may be instances in which the Commission should give its approval to amortizing payments over a longer period than the current year in which payment is made.

"*Fourth:* We feel that where companies have undertaken to pay pensions, even if the plan be styled a so-called voluntary plan under which the company may claim it has no legal liability, there exists a high moral responsibility and, as a practical matter, a voluntary plan of long standing cannot be terminated without destroying good labor relations or by compensating the employees in some other form. Where liabilities exist, that should be made known by foot notes to the balance sheet or other appropriate entries.

"It has been argued that the present provisions in the uniform system for electric and gas companies are adequate to take care of the problems before us provided we interpret them as they are interpreted here in relation to past services. If there is any ambiguity in those provisions, they will in the future be interpreted in accordance with this memorandum until such time as the revision is complete.

"With the exception of some portions of the bus industry the relations between labor and management in the utilities in this state are uniformly excellent. In general the workers in the utilities have a high standard of morale. In the utility field above all others a breakdown in good labor relations most seriously affects the public. As previously stated, we have no control over the process of collective bargaining, nor should we attempt to exercise any such control. We must, however, make our determinations in the regulation of utilities so as to remove any obstructions from the path of collective bargaining and to adopt those policies which promote good labor relations, and therefore, better service to the public. For this reason alone, even if we were not compelled to make the determination by the modern legal concept of pensions, we should adopt the principles enunciated here."

Commissioner Arkwright, in his dissenting opinion, stated:

"I do not oppose retirement or pension plans.

"The members of this Commission, and of the prior Commission, were and are in complete accord as to their desirability and the good that necessarily flows from them.

"The only point of differences, and the only problem presented, relates to the accumulation of funds to provide for services rendered in the past by employees to a company and to whether present and future consumers should have to pay costs that previous consumers might have had to pay, if such plans were in effect.

"The matter has been before this Commission on several other occasions, and has been most carefully considered. In newly established pension plans, or in those already established where proper actuarial provisions are provided for to take care of retroactive service, the cost thereof must be met. A determination has not been made that these costs should not be paid by the utility or by contributions of the employees, but should be passed on to the public, present and future. This means that, throughout the State, where such plans may be set up, or are in being, that these costs must be passed on in the form of increased rates, to the users.

"The previous holding of the Commission in no way passed these costs on to the public. It in no way prevented the utility and its employees by agreement and by contributions among themselves from inaugurating and maintaining any kind of retirement or pension plan, whether with accumulated back costs or not. Thus an accumulation of what amounts to past debt, or expenses in connection therewith, was not passed on to current and prospective customers, and their rates were thereby not increased."

Preliminary Coke Statistics Issued for 1949

Output of coke in the United States in 1949 decreased 15 per cent from 1948, according to preliminary data submitted by coke producers to the Bureau of Mines, US Department of the Interior. This drastic reduction was due to (1) slackening in steel demand in the second quarter of the year, (2) initiation of a 3-day work week at bituminous-coal mines in July, and (3) complete work stoppages for various periods in both the steel and bituminous-coal industries in the last quarter.

The rate of production at oven-coke plants started to decline slightly in the last half of March and continued the trend until October when output dropped to the lowest figure since May 1946. The work stoppage in the iron and steel industry beginning September 30 forced virtually all "furnace" oven-coke plants to bank their ovens until the middle of November when a new management-labor contract was negotiated.

Construction of new coke ovens continued at a fairly high rate in 1949, and 465 new ovens with an annual coke capacity of 2,295,000 tons were completed and 258 new ovens with a yearly capacity of 1,568,000 tons of coke were under construction at the close of the year. All the new construction does not represent additional coke capacity as some of the new ovens were replacements of obsolete facilities.

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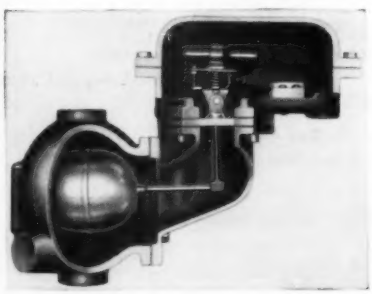
A new, explosion-proof float-operated electric controller for water tanks, receivers and other liquid storage systems has recently been announced by McDonnell & Miller, Inc., Chicago, Ill.



Known as No. 65 it has been Underwriters' tested and approved for use under the following conditions:

Class I, Group C—Atmospheres containing ethyl-ether vapors, ethylene, or cyclopropane.

Class I, Group D—Atmospheres containing gasoline, petroleum, naphtha, benzine, butane, propane, alcohols, acetone, benzol, lacquer solvent vapors, or natural gas.

New England Frontier

(Continued from page 34)

involved, should be explained. And, above all, be sure to allay the inevitable concern of the customer over the quality of this new and—*to them*—unknown natural gas. Even tell them the reason for adding an odorant to it. These public-relation-wise aspects and concepts are truly magic catalysts.

The acceptance of natural gas (which is the reaction) will be accelerated by a catalyst known as education. The contact will result in good will which must be retained unchanged at the end of the changeover.

Not only in the minds of consumers, but also in the minds of too many managements, the coming of natural gas is welcomed as a panacea. Permit me to quote from the 1949 Annual Report of a well-known straight gas company, on the eastern seaboard, as to their experiences:

"By changing to the distribution of straight natural gas in 1946-1947 the company was able to continue serving its customers at rates which were no higher on a thermal basis than the prewar level. However, early in 1949 it became apparent that the cumulative effect of steadily rising costs of labor and materials had more than offset the initial economies of operation obtained from the distribution of straight natural gas. Accordingly, we applied to the . . . Commission last July for authority to charge higher gas rates. . . ."

Recently the *Wall Street Journal* headlined: "Coal's Competition—Gas and Oil Grabbing More Industrial and Domestic Customers," and went on to quote one of the largest New England coal wholesalers as saying, "I'm sick when I think what's happening to the (coal) business." Some idea of what he had in mind is explained in the same news article where the East Ohio Gas Co. is quoted as filing gas heating applications at the rate of 1,000 a week this year, while last year 70,000 new customers were added in the company's five-county area. And Standard Oil Company of Ohio is convinced that oil heating in areas of the state outside the reach of natural gas supplies will increase by 25 per cent in the next twelve months. Big home builders say that just before the war 65 per cent of all new homes going up in the greater Cleveland area had coal furnaces; that proportion has now dropped to 5 per cent. This is "writing on the wall" for New England.

In a recent address* by Edward Falck on the subject of "Natural Gas Expansion, Oil Markets, and Federal Policy", it was stated:

> "An estimate made for 1947 showed that 33 leading oil companies held some 116,000,000 acres of gas reserves or 62.5 per cent of the total acreage."

Though the earnings from the sale of

* *Before the third annual convention of the National Federal of Financial Analysts Societies, New York, March 1950.*

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Nation-wide consulting firm has vacancy for a Gas Engineer with minimum of 8-10 years experience in the production, transmission and distribution of natural and/or manufactured gas. Location: New York City. Some travel involved. Reply giving details of experience and education. Box 215, c/o American Gas Journal Inc., 205 E. 42nd Street, New York City 17.

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natural gas represent a substantial percentage of the total earnings of these oil companies, just ponder whether they will permit the disparity in prices to continue.

To summarize: Natural gas has many advantages, but experience indicates that there are certain matters that must be given careful attention. Here are some of the pitfalls:

a. In the zeal to expand markets there is a tendency with gas house heating to make rates that will appeal to the mass market. With a large part of such a market achieved you assume a tremendous public responsibility, especially in northern climates. With a large number of customers dependent for heat on your ability to perform in zero weather, you just cannot fail without awful public relations repercussions.

b. You should be careful to price your service so as not to end up with an over-sold market, with all its headaches. Many companies now have such a low price for house heating service that they must hide behind service restrictions, else they will get a deluge of load they cannot supply without expensive investment, which their rate structures will not have anticipated.

c. It is a company responsibility to a community to supply a service which they can make available to all and not limited to those who may now have the service. Since this type of load involves a large investment on the part of customers, as well as vitally affecting their living habits, it should be provided on a basis that will assure continuous and adequate service over a long period. This means a very careful approach to the matter of under-pricing of the service in order to enjoy temporarily an increase in net earnings.

d. Cold waves generally sweep the country from the west to the east, and the west gets its natural gas from the same areas from which the eastern supplies will come. New England may find difficulty with a source of supply 1500 to 1800 miles away with the source already heavily drawn on by the time the cold wave strikes the east. We have had a mild winter, and even in this past mild season many industries had to shut down due to shortage of natural gas.

e. Any special consideration given to house heating load should be based on a "backed-up supply" of some sort. This will cost money, since such peak reserve is used only a day or two a year on the average. With only a 20 per cent gas house heating saturation, the top 20 per cent of the maximum load comes only on an average of one day a year; and that volume-wise it is some seven times the summer load. This means increased distribution main capacity as well as a backed-up source of supply.

f. Since the use of natural gas may result in varying thermal values in various cities in order to provide the needed service, a therm rate is vital and should be introduced now.

g. Combustion characteristics of natural gas (methane) are radically different than those of a gas containing hydrogen and carbon monoxide, and conversion of customers' appliances to natural gas involves the doing of many things that at first the customer may not like.

Whether 1950 is the end of a half-century or the beginning of a new one, New England gas-wise is at the brink of a new era. And I use the word "brink" advisedly, for a mis-step now can mean immeasurable damage and almost irreparable harm. Therefore, I say to you—"Be rate-wise and public-relation-wise and 'enrich' yourselves with natural gas."

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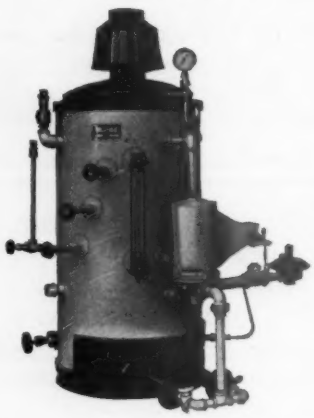

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